Standard Size, 9 x 12. FEBRUARY 23, 1899. Price Six Cents.

AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

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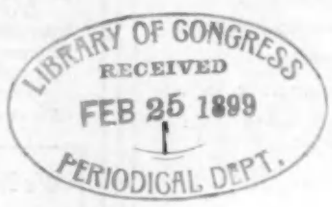

that the Flat Turret Lathe is a machine designed to hold a certain combination of convenient and simple cutting tools that performs all of the turning and threading operation on nearly every piece of lathe work under 2 inches in diameter and 24 inches in length.

It is not like other turret machines.

It does not require a lot of special tools.

The Flat Turret Lathe comes fully equipped with tools and is ready to run as soon as belted.

Our instructing operators "break in" your workmen.

We guarantee a saving and our method of demonstration leaves no question of doubt.

We have sold up to date over 1000 of these machines, all of the same size and design, and they are used in all kinds of machine shops where there has been work for three or more engine lathes on the work within the capacity of the machines.

The quick adjusting properties make it possible to make one piece of a kind quicker than by the engine lathe and the same properties make it more desirable than other turret machines on regular screw machine work. Sold in America solely by the builders,

Jones & Lamson M'c'h Co.,

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Grinding and Polishing Machinery.

Every machine, small or large, is set up in our shops and tested at a speed greatly in excess of that to be met in shop practice.

We are sure of the successful operation of each and every machine before shipment.

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For sale by the trade generally, and by Charles Churchill & Co., Ltd., London, England; Fenwick Frères & Co., Paris, France, and Schuchardt & Schütte, Berlin, Germany.

Whose Fault Is It

if you persist in using an old lathe that's about ten years behind the times, and lose money because you refuse to investigate the merits of a strictly up-to-date lathe that instead of lessening your capacity for work will increase it, and thereby, increase your profits?

Surely, it's no fault of ours, when we are not only willing but anxious to place you in possession of every facility for finding out all that anybody knows, whether good or bad, about such a lathe—our No. 2 Improved Cabinet Turret Lathe.

We claim that our No. 2 Improved Cabinet Turret Lathe is the best, not "just because," but for a good many good reasons which we shall be glad to give you, on request.

Write us to-day for full particulars.

American Tool & Machine Company,
Boston, Mass.
Founded 1845.
Incorporated 1864.

YOU'VE FOUND TROUBLE SOMETIMES . . . . . .

haven't you, in tempering articles of irregular shape? Sometimes you've burned the life out of the thin portions of a piece of metal, in order to properly temper the thicker parts. Then, again, you've managed by skillful manipulation of a clumsy tempering furnace, to temper a thick part without ruining the thin one, but have failed to get that uniformity of results that is so necessary in tempering operations.

The American Gas Furnace Co.'s Tempering Furnaces are designed to avoid all such troubles, and they do avoid them. Using gas, the heat is easily adjusted to the desired degree and just as easily maintained. The burner, for certain kinds of work, is divided into three sections, each under separate control, and the tempering chamber is easily kept at a uniform heat.

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Our big catalog is a regular encyclopedia of Gas Furnace information, and is free for the asking.

We Make Fuel Gas Plants, too

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Has it ever occurred to you that babbitted shafting boxes are an expensive device?

Anything which costs more to operate than another thing equally good for the purpose is an expense.

Hyatt Roller Bearings consume so much less power that their whole cost is wiped out in one year.

Babbitted boxes cost 60 per cent. more each year to operate than their market value. It will pay you to do some figuring.

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to make a trial of the Haeseler Reamer. If it isn't as good as we say, you can't lose much, and if it is, you've a great deal to gain.

We claim for the Haeseler Reamer that it will outwear and outwork the best of other kinds. It is made in a way and of a kind of material—the best tool steel—that warrants us in making that claim.

It is especially recommended for reaming rivet holes with air motors or by hand.

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Built ONLY by
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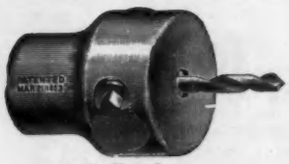

Style B—Two-Jaw.
Or CHAS. CHURCHILL & CO., Ltd., London and Birmingham, Eng.

Ask your nearest Dealer, or send to the Manufacturers for

THE LATEST

IMPROVED DRILL CHUCKS,

Strong, Accurate, Durable, Cheap.

THE E. HORTON & SON CO.,

WINDSOR LOCKS, CONN., U. S. A.

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Successor to C. W. LeCount,

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We manufacture ten distinct styles of Lathe Chucks, four styles of Drill Chucks, Centering Chucks, Face Plate Jaws and Chucks for special service. Send for new catalog and discount sheet.

The Cushman Chuck Co.

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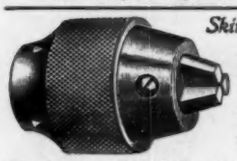

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Drill Chucks.

Trump Bros. Machine Co.,

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Of all Descriptions. Combination and Universal, with Patent Reversible Jaws. Independent Chucks, Geared Scroll Chucks, Face Plate Jaws, Machinists' Tools. Send for Catalog.

The Hoggson & Pettis Mfg. Co. New Haven, Conn.

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taken out of drill shanks that are held by the Reid Chuck; yet the "Reid" holds them so they can't slip. Read the book about Reid Chucks.

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Self-Opening and Adjustable.

The only mechanically correct automatic Die Head on the market. All leverage entirely overcome. Makes a full and perfect thread in one cut, and besides it can be accurately adjusted. Saves 50 per cent. in time and wear over solid dies. Made for cutting from No. 17 wire gauge to 6 in. diameter, and arranged for any style of thread. Adopted by all principal manufacturers of bicycles and bicycle fittings throughout the country. WHY? Write us for particulars and prices.

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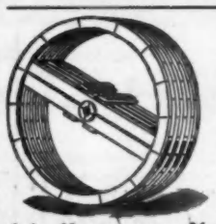
For Advertisement of

TIGHT JOINT CO., New York,

See Issue February 2, 1899.



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Lighter than an iron pulley. Stronger than a steel pulley. Each pulley will fit thirty-five sizes of shaft. No set screws. No keyway. Complete stocks carried in every jobbing center in the United States. Also

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Drills for Light Work.

We make drills from one to eight spindles, hand and automatic feed. Send for price of the

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Double Head Traverse Drills; also Adjustable Two Spindle Drills, Tapping Machines, Cutter Grinders, Surface Grinders, Centering Machines.

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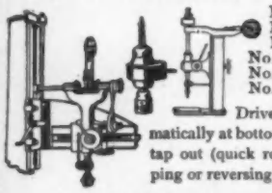
Errington

The ONLY Automatic Reverse. No Backing Belt. No Special Taps. No Extras. Fits Socket of ANY Drill Press. Either Friction or Positive Tool Holder.

Tapping Chuck



No. 0 taps 1-16 to 3/8.
No. 1 taps 1/8 to 3/8.
No. 2 taps 5-16 to 1.
No. 3 (pipe) taps 1/4 to 1.
No. 4 taps 3/8 to 1 3/4.
No. 5 taps 1/2 to 1 3/4.

Drives tap in, stops automatically at bottom of hole and backs tap out (quick return) without stopping or reversing drill press spindle.

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Gravity Slip Chuck

Tools changed and friction adjusted while spindle is rotating without danger to operator.

Tools connected by pressure against work; disconnected by gravity, yet supported in spindle.

ERRINGTON AUTOMATIC-REVERSE

Drill Press Turret

Drills the hole, taps it and then sets the stud in, all without stopping or reversing drill press and without moving work.

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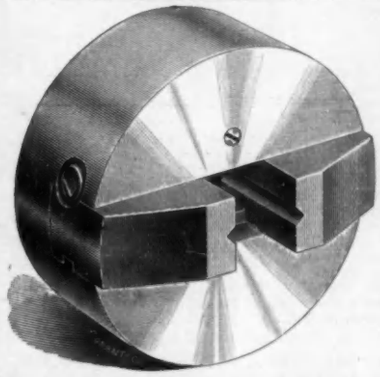

Whiton's Two-Jaw Chucks

are made with hardened steel thrust shoulders for retaining the screws in place and for receiving the wear. These allow the screw threads to extend fully to the outside of the Chuck, giving the jaws greater traverse and increasing the safe capacity of the Chuck, as compared with other Chucks of similar size. These Chucks are kept in stock in three sizes.

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Leshure's Safety Collar Is Loaned Free to Users of the **Hampden Wheels** HAMPDEN CORUNDUM WHEEL CO., Send for Circular. Brightwood, Mass.

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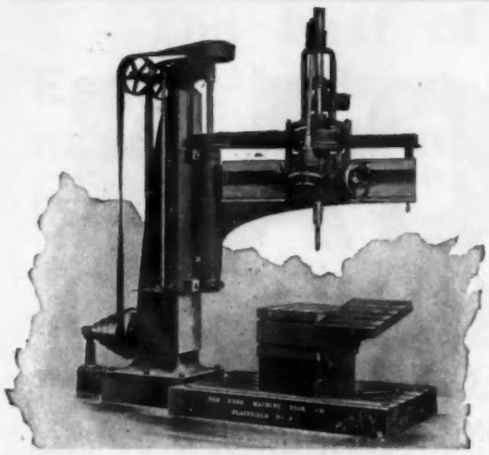

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MASSIVE. POWERFUL. ACCURATE.

Two sizes—5 foot and 6 foot arms. Both sizes take 89 inches between spindle and base. . . .

We have on hand completed parts of both sizes enabling us to make very quick deliveries. . . . .

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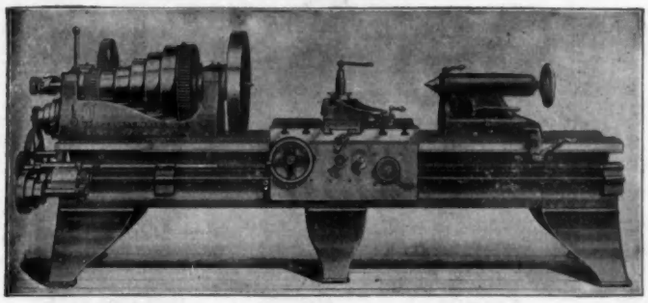
PHILADELPHIA—Bourse Building. ST. LOUIS—615 North 4th Street.
PITTSBURGH—Carnegie Building. LONDON—39 Victoria Street, S. W.



24-INCH SWING SCREW-CUTTING ENGINE LATHE.

Draper Tools Have Always Been Good Tools---

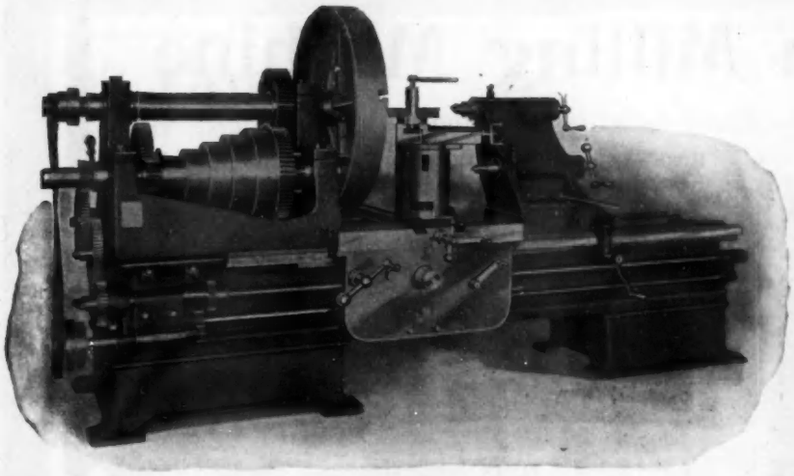
have always paid their way, wherever and whenever used. They're honestly made of honest material, are strong and rigid, have large bearings, and will never flinch under the heaviest of work. You'll find them wherever good tools are known and properly valued. We make prompt deliveries. Send for new catalog B, which shows our complete line of improved tools.

Draper Machine Tool Co., Worcester, Mass., U.S.A.

ESTABLISHED 1845.

Sole European Agents: Selig, Sonnenthal & Co., 85 Queen Victoria St., London. Sole Agent in Germany: E. Sonnenthal, Jr., Neue Promenade 5, Berlin.

McCabe's Pat. Double-Spindle Lathe.



Gives You Two Lathes in One.

One a 26-inch swing for the common run of work, and the other a powerfully triple-geared 44-inch swing for heavy work. This Lathe is a substantial, carefully built, well designed tool that has long ago passed its experimental stages, and it costs but little more than an ordinary lathe, though the range of work that may be done on it is more than double.

Fuller particulars for the asking.

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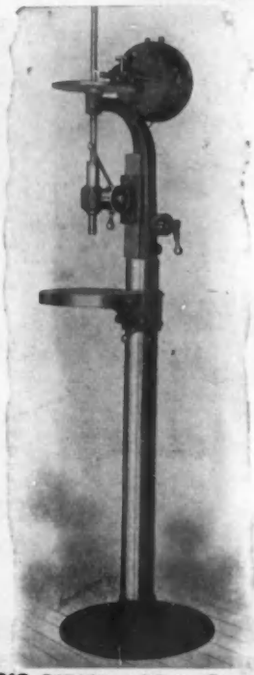
Pulleys, Ring Oiling Hangers.

Pulley Moulding Machines, Pulley Lathes.

T. B. WOOD'S SONS,

Chambersburg, Pa.

WILLEY ELECTRICALLY DRIVEN



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Capacity
0 to 3-8 in.
FRICTION DISK DRIVE.

o

Speed changed from 300 to 1100 revolutions instantly.

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No Belts, No Countershaft. No Trouble.

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Mnfd. by
Jas. Clark, Jr., & Co.
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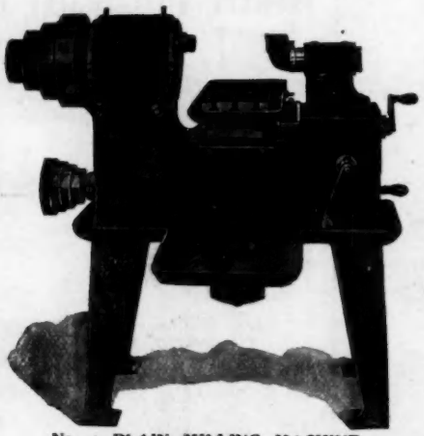

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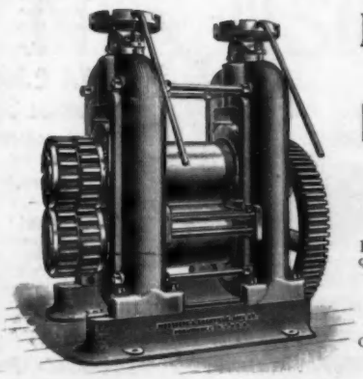

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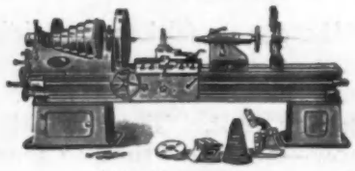

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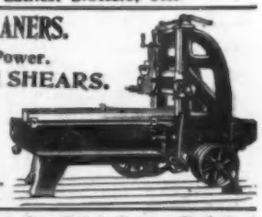

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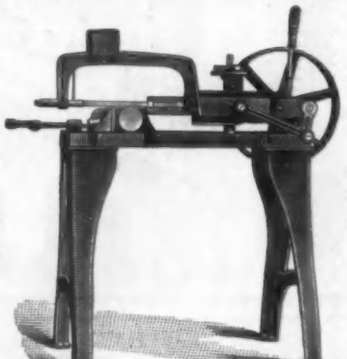

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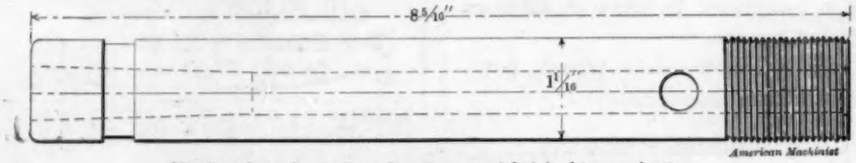

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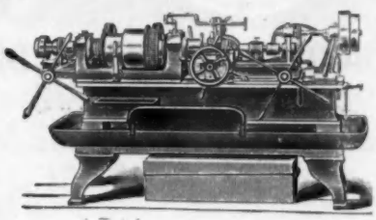
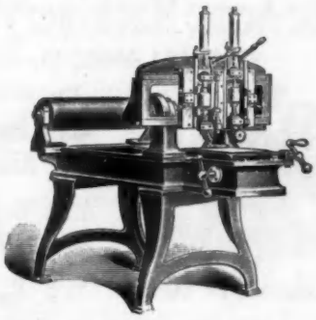


Bicycle Hub Forming and Drilling Machine. First Operation.



The bar held by a spring collet, operated by a spider wheel, is fed through the spindle while machine is running. The cutters, of circular form, can be ground easily without changing their original shape. Machine is furnished with one pair of cutters and two drills for first operation on either front or rear hub, an automatic oiling arrangement, two countershafts and wrenches. Will turn out fourteen hubs per hour. The second operation machine forms the end left unfinished in first operation and cuts the thread on rear hubs.

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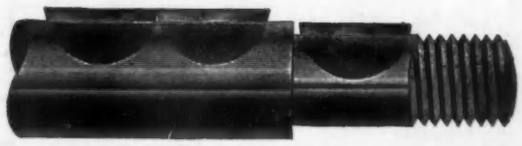

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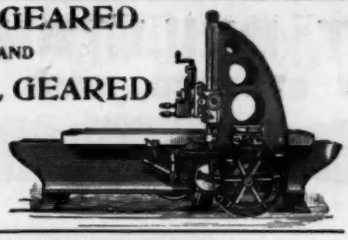

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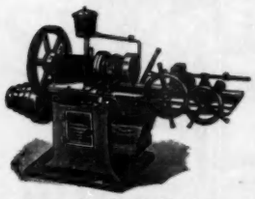

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A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION

VOLUME 22 NEW YORK, THURSDAY, FEBRUARY 23, 1899 NUMBER 8

About a Drill Jig.

BY A. H. CLEAVES.

I say "about a jig," because I intend to supplement a description of the same with that of a gang-drill used with a jig as an improvement, or what a facetious mechanic that I met at one time would call a "rapidizer."

We thought we had a pretty good jig, until a large order for the article manufactured with it came in, and the drill referred to was made to get results faster.

The jig shown in Figs. 1 and 2 is similar to another that I have described, but may contain some additional features of interest.

The bulk of the jig, for the purpose of giving a good support to the locking cam, is cast solid, as seen at *A, A, A,* etc., and the work *K* rests upon two projections of the same casting *A* (see Fig. 1). The eccentric cam *C* on the shaft *B* with handle *D* moves, in tightening the work, with the arrow, and throws the casting to be drilled against the gage and stop-bar *J*, fastened, as shown, to *A*. The work is readily placed in the jig and secured quickly and firmly, dropping onto the gage screws *L L* one way, and the bar *J* the other.

As first used, the jig was provided with a fixed bushing *F*, which guided tools or tool for milling the shoulder, and facing the end of the hub seen at *M*, Fig. 1.

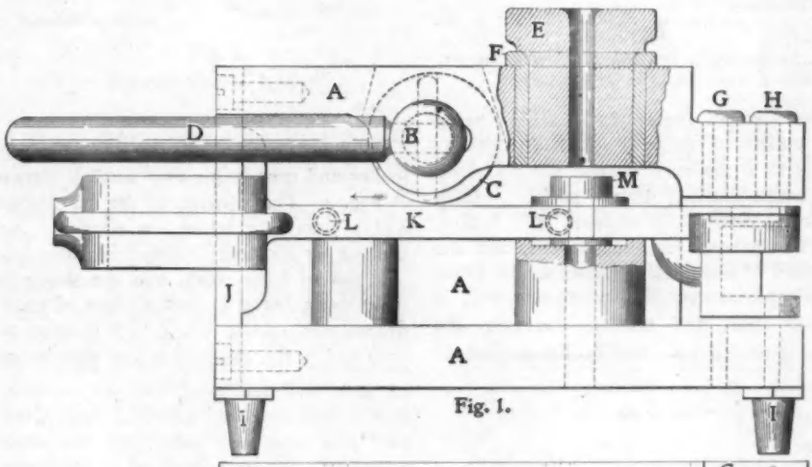


Fig. 1.

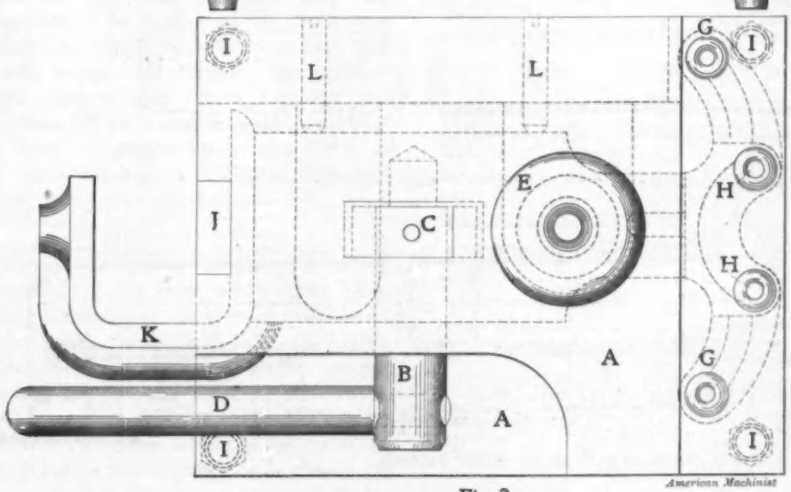


Fig. 2.

A DRILL JIG.

Before this a movable bushing *E* had been inserted in *F* and the ¼-inch center hole in the hub drilled. The other holes *G, G* and *H, H* are plain, also the jig feet *I, I, I, I.*

Peoria, Ill.

Some Points of Practice From a Manchester Shop.

The establishment of Hans Renold, of Manchester, England, has been referred to in these columns as one which is pervaded with ideas. These ideas are both adopted and original, and the adopted ones are mainly American—not entirely so, however, for Mr. Renold is altogether too broad minded to confine his appreciation of good shop practice to that of any one country. His pilgrimages to the Continental countries, as well as to America, have been frequent, and his familiarity with all of them makes his choice of our own best practice as his principal model all the more complimentary to us.

As our readers know, the principal business of Mr. Renold is the manufacture of transmission chains, of which he makes very large quantities, from the smallest, such as used on racing bicycles, to such chains as are capable of transmitting considerable amounts of power. I saw them in his works transmitting motion from one line of shafting to another, driving emery grinders, milling machines and other tools used in manufacturing operations; his use of them being in some cases intended, I suppose, more as a test of their extreme adaptabilities than as an example of what he would recommend to others. A most remarkable thing it was to see his new "Silent" high speed chains (illustrated in our issue of May 19, 1898) running at the high speed required to drive an emery grinder, and doing it with all the smoothness and absence from noise that characterize a leather belt. Indeed, such chains when running look very much like leather link belts, and Mr. Renold informed me, are often mistaken for them by people who come into his factory and for the first time see them running. At the time of my visit to the place an extensive addition was being made to the factory buildings, and it was evident that it had been the determination to have everything of the very best. It is the practice to buy whatever is needed in the way of standard tools and machinery, and most of this comes from America, but in the manufacture of the many kinds of transmission chains made here a good deal of special machinery must be used, and most of this is made in the establishment. This, together with the fact that a good deal of good tool making is required, calls for a machine shop in which quite a number of men are employed, aside from those that work directly upon chain production.

It is not practicable for me to give a

general account of the factory, but some points of the practice can be given, which are characteristic of the whole, and may be suggestive to others. I am indebted to the kindness of Mr. Renold for the drawings used in showing these things, and in looking them over I note that all dimensions are expressed in decimal parts of an inch instead of in common fractions, which is perhaps a significant point for those who insist that continual bisection is the only proper and practical method of measuring and computing fractional quantities.

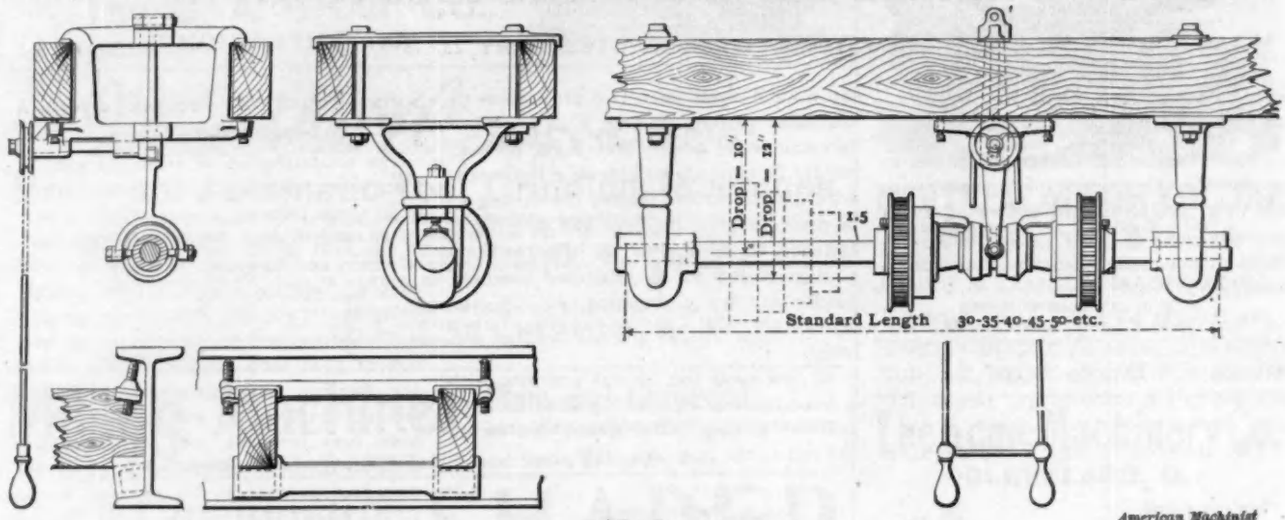


Fig. 1

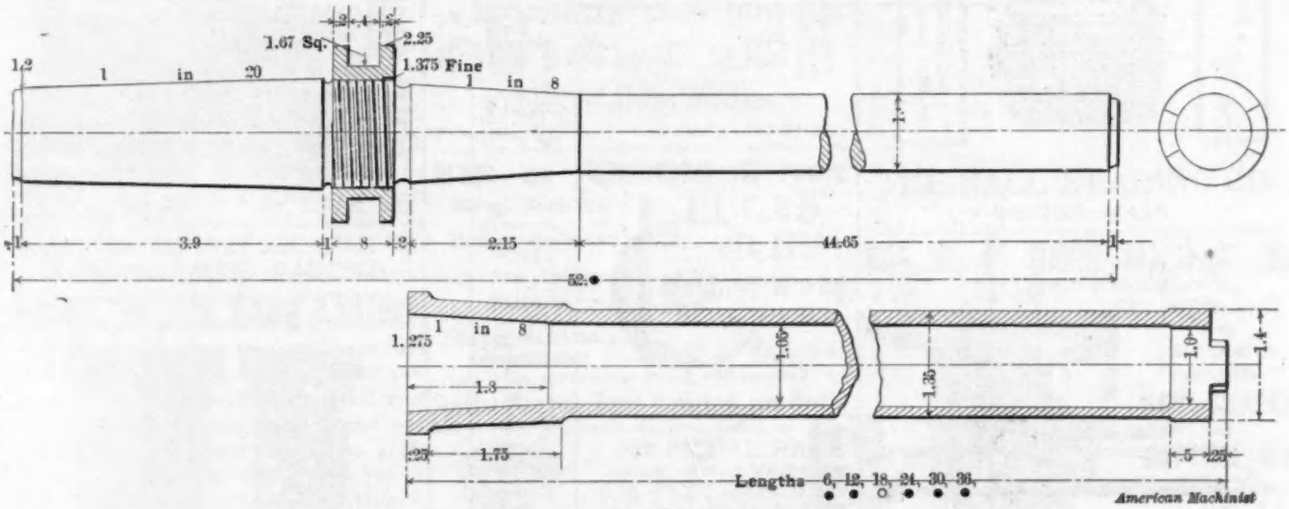
HANS RENOLD'S STANDARD COUNTERSHAFT.

A COUNTERSHAFT.

At Fig. 1 is shown the standard countershaft arrangement of the shop, and to secure the familiar advantages of having as few sizes as possible, two sizes of this shaft (1½ inches and 2 inches) are made to answer for the entire range, though some of the smaller machines could be driven well enough from 1⅛-inch shafts. The drawing shows the counter fitted with sprocket wheels for the transmission chain referred to above, but it is, of course, also fitted with pulleys for belts, when these are advisable. The hangers, which are a modification of Brown & Sharpe's self-oiling hangers, are attached to 3x6-inch timbers, but without boring holes through them; the fastening being by means of clamps, which permit the hangers to be very readily slipped along the timbers to any desired position. Each pair of timbers is secured to I beams, fixed overhead for the purpose, and the method of fastening is shown at the lower left-hand corner of Fig. 1, where it is shown that the timbers carrying the countershafts can readily be shifted to any desired position, and it is noticable that countershafts can be put up anywhere without boring or drilling a single hole. Cords with handles are used for throwing the clutches instead of the usual wooden shipper-rod, the shaft to which the sheave-pulley is attached carrying at its inner end a small crank-pin which engages with a slot in the lever pivoted above, as shown. The chain drive seems to have special advantages where the distance between shaft centers is very small, because the chain drives equally well no matter how close the pulleys may be. They need only to clear each other to work satisfactorily.

BORING-BARS.

A form of boring-bar which Mr. Renold makes and uses in his own work is shown at Fig. 2. This consists of the bar proper and a steel tube which fits over it. No drilling or slotting is required; the bar is a job of lathe work, and the sleeve is little more, being in fact a piece of cold-drawn steel tubing, which is first upset at each end in the smith shop and then bored out as shown at the ends only; the outside being merely polished without turning, or, in some cases, having a light cut taken over it. Between the taper shank of the bar and the inner end of the sleeve a threaded collar or nut is placed, by means of which the bar may be removed from the machine spindle, or the sleeve from the bar; no hammering being per-



BORING-BAR MADE AND USED BY HANS RENOLD.

mitted for such a purpose under any circumstances. The clutch teeth at the end of the sleeve drive the cutter-head, and there are, as shown by the figures, below the sleeve, six standard lengths of these sleeves, the small circles that have been filled up black on the drawing indicating,

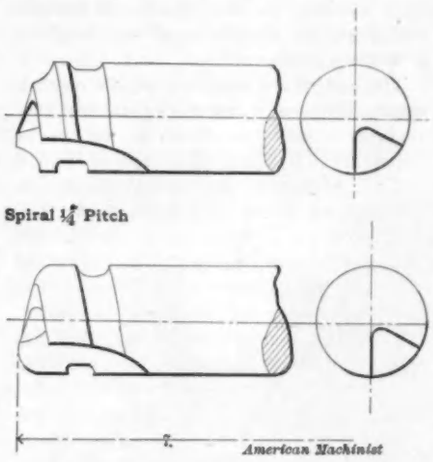


Fig. 3

FORMED LATHE TOOLS.

I think, those sleeves that have actually been made, and are on hand for the given bar, which is 1 inch diameter and 52 inches long over all. The taper of 1 in 8 for the end of the sleeve was chosen because the standard taper of the establishment (1 in 20) was found to be "too keen," that is to hold too tightly. Mr. Renold thinks that 1 in 10 would really have been better in some respects, but the reamers for the taper adopted were on hand, and it works satisfactorily. These bars run very true and nice, and they seem not to be subject to the destructive influences which operate to deface and finally render the ordinary bar useless. Four sizes, ¾ inch, 1 inch, 1½ inch, and 2 inches, all of the same length, are kept on hand in suitable racks, and these do all the boring-bar work of the place, and do it with entire satisfaction.

FORMED LATHE TOOLS.

Though the matter of neatly rounding corners in doing lathe work seems relatively unimportant, it is here considered to be worth doing well, if at all, and a system of tools has been adopted for the work which, besides reducing its cost to the minimum, insures uniformity, and that when a corner with a given radius is called for by the drawing or is chosen by the workman, the corner shall really be of the radius intended, instead of merely a more or less close approximation to it. The tools referred to are formed on the end of round bars of steel, as shown in Fig. 3, and are themselves made in the lathe; so that, in a certain sense, they may be said to be capable of reproducing themselves. These tools probably cost little, if any, more than those made in the ordinary way, and by grinding on the flat radial face of the opening only, they retain their form and last for a very long time. Similar tools are used for external and internal thread cutting in the lathe, and for many other purposes, both special and general. Each lathesman (in England, "turner") has a set of these tools on a revolving stand beside his lathe, and they are very generally made use of. Mr. Renold informed me that they had been developed by the foreman turner and himself, and that he felt sure that if they could be generally known they would be highly appreciated everywhere. They are at first made about 6 inches or 7 inches long, and when one of the formed ends has been entirely used up it is annealed and re-formed on the same bar, which is otherwise just as it comes from the steel maker.

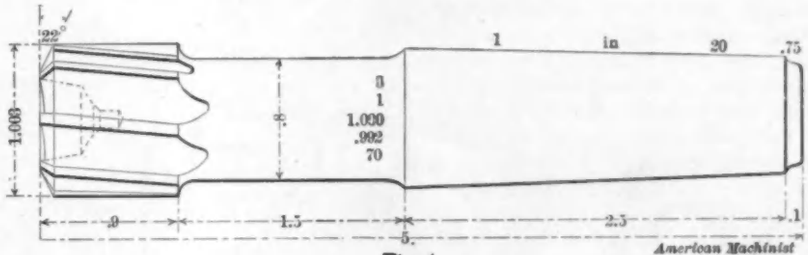


Fig. 4

CHUCKING REAMER WITH TAPER SHANK AND NEW METHOD OF MARKING.

REAMERS AND A SYSTEM OF MARKING THEM.

The standard chucking reamer used here is shown in Fig. 4. The angle of the spiral is about 9½ degrees, and the center upon which it is turned and ground is located some distance from the end, as shown, so that the teeth on the end may be ground and deepened from time to time, as required, without interfering with it. These reamers are stamped when new with a series of three figures, indicating sizes. Taking the inch reamer, for instance, it will be stamped on the shank, as shown, the figures 3 and 1 above 1.000 indicating that its actual size in this instance may vary between 1.001 inches and 1.003 inches. The first time the reamer requires sharpening it is ground to a size which may vary between 1.000 inch and 1.001 inches. The figure 3 on the shank is then ground out, and the remaining figure 1 above the 1.000 indicates the maximum size the reamer may be. The next time the reamer is ground it may be reduced to .992 inch, and its size will be between that and 1.000 inch, and the figure 1 is then removed by grinding. At the third grinding its size will be between .992 inch and .970 inch, and the figures 1.000 are then ground off from the shank, and finally at the last grinding the second and third figures of the .992 are ground off, and the remaining ones show that the

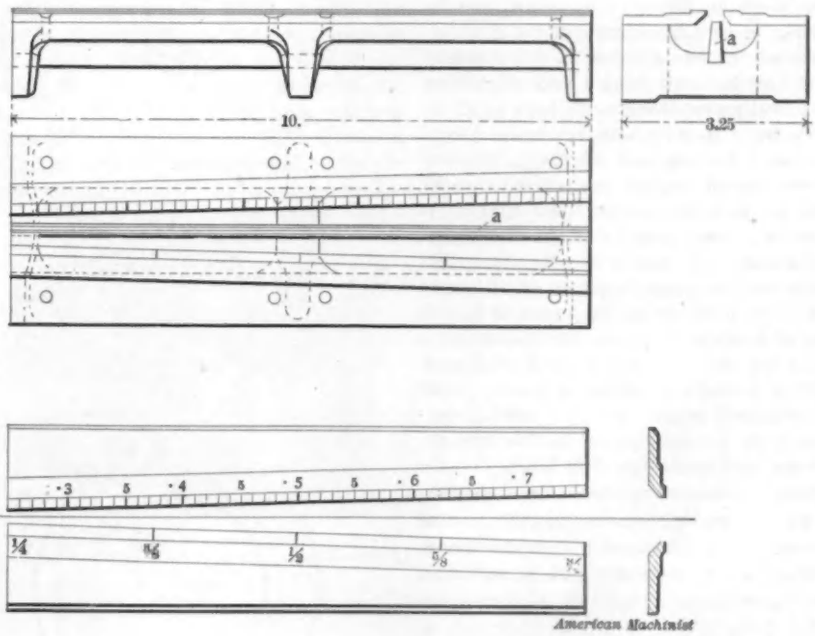


Fig. 5

TAPER SHANK GAGE, 1 IN 20.

reamer is .970 inch or below; the third grinding reduces it to a size which is used only for roughing or for some special purpose. The drawing shows the shortest 1-inch reamer; there are two others similar, but with longer shanks.

TAPER SHANKS AND GAGES.

The shanks of the boring bars, the reamers, and in fact all the tools of that character, in Mr. Renold's shop have a taper of 1 in 20, which is believed here to be the best possible for the purpose. This taper, it will be remembered, was recommended and some of its advantages explained by "Jarno" in our issues of October 13 and 31, and November 14, 1889; the article of the last named date giving an illustration of a device for gaging the tapers accurately. Mr. Renold, instead of using disks of known diameters by which to set the steel straight-edges to the right angle, makes each gage precisely 10 inches long, and then sets it upon the bed of a surface grinder and gages the displacement of one end of the gage laterally, first one way and then the other, and finally raises one end by a gage the proper amount to grind the edge of the supporting piece *a* to the proper angle. The manner of graduating the straight-edges is shown in Fig. 5, the graduations on one side representing the diameter at any given point in decimal parts of an inch, and those on the other side in common fractions, as indicated. Although these may look to be rather formidable tools to make, with proper fixtures fitted to a B. & S. surface grinder, as Mr. Renold has them, the work is very readily done, and he speaks in very high terms of the good results of the introduction of this standard taper in his own works, and of making practically everything to conform to it. He declares it is more satisfactory in respect of sure holding and of ready removal from spindles than any other that he has seen, and that the fact that it is just 1 in 20 gives it many incidental advantages arising from the fact that a shank or gage increases in diameter just 0.01 inch for each 0.2 inch in length, or, as I find it more convenient to express it, 0.005 inch for each 0.1 inch of length. Those who have turned or ground taper shanks and gages, etc., will readily perceive the convenience of this definite relation; besides which, it is found that the shanks of the various tools are a convenience in quickly determining the size of holes. For instance a taper shank which is 0.75 inch diameter at the small end and enters a hole for 1 inch shows that the hole is 0.75 inch + 0.005 inch × 10 or 0.8 inch diameter. In the same way if it enters 1.5 inches the hole is 0.825 inch in diameter, and so on. Mr. Leland, of Detroit, it may be remembered, is also an enthusiastic advocate of this as the standard taper and has published a small pamphlet upon the subject.

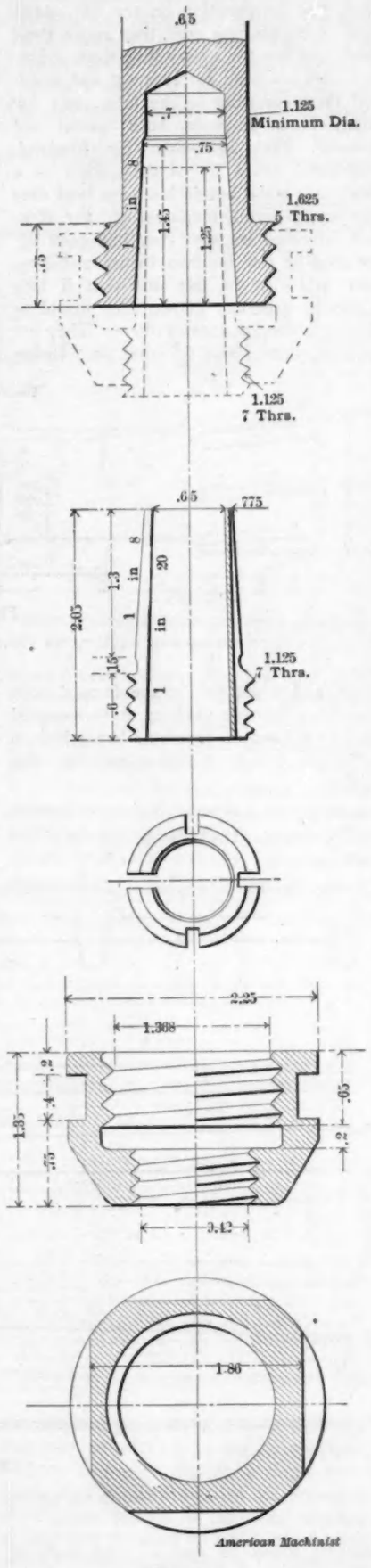


Fig. 6.

MUIR CHUCKS FOR TAPER SHANKS.

CHUCK FOR TAPER SHANKS.

All drills, cutter-arbors and shanks of reamers, etc., in the Renold shops are made with plain shanks, as shown in Fig. 4, and are held in chucks such as are shown in Fig. 6. This chuck is the invention of Mr. Alfred Muir, of Manchester, and from what I saw of its practical working in the Renold shops and elsewhere, Mr. Renold's enthusiasm about it is fully justified.

The end of the machine spindle or of a chuck fitted to it, as circumstances may require, is made as shown at the top of the figure. It has a hole tapered 1 in 8 and is threaded externally, as shown. Split spring collets are made to fit this, and the holes in these collets are in this shop, of course, made to the standard taper already spoken of. These collets are also externally threaded, as shown, but with a finer thread, and, the nut being made to fit both these threads, when it is turned one way it draws the collet firmly into the socket and holds it there, clamping it tightly upon the taper shank within the collet. Turned the other way, the collet is forced out and the shank released. There are, of course, several different sized collets for each chuck. It should be noticed that by this system a plain shank, without tang or key, is made use of, which obviously simplifies the making of those pieces which must always be renewed from time to time. A turn of the wrench securely locks or instantly releases the tool, and there is no slipping.

In this matter of special threads, Mr. Renold manages to simplify things a good deal by making them, wherever possible, of the standard pitch for screws of half the diameter of the one to be cut. By this means special chasers are avoided, and there is order instead of the usual chaos in such matters. F. J. M.

Motocycles at the New York Cycle Show.

At the cycle show at Madison Square Garden, New York City, January 21 to 28, there was not very much of novelty in the way of bicycles, and while the attendance was large, the few motocycles shown attracted eager attention, while the bicycles were comparatively neglected. The motor wagons were besieged by crowds seeking information; many of these expressed themselves as intending purchasers, and were particularly interested in the three low-priced exhibits, the Orient electric vehicle, the Oakman-Hertel wagon, and the Tinkham tricycle. Riker showed a delivery wagon, phæton, and tricycle, all electric driven, highly finished, of elegant appearance and high in price, the four-wheelers rating at about $2,000, the tricycle at $850.

The Pope Company also showed a fine assortment of electric vehicles, even higher in price than Riker's, ranging from

$2,250 to $2,750, near this being the exhibit of a finely finished electric four-wheeler, built by the Orient Cycle Company, with a selling price of $1,000. This wagon has a range of speed of from three to twelve miles an hour forward, and from three to six miles backward. The brake consists of a friction drum on each rear wheel hub, fitted with a powerfully applied band.

The Orient four-wheeler shown in Fig. 1 weighs 1,000 pounds, and is listed at $1,000.

There is a great market now for a motor vehicle to carry two passengers, that can be sold for five or six hundred dollars. This seems to be the figure which intending buyers are ready to pay. There are comparatively few persons who can afford to pay from two to three thousand dollars for an automotor, but there are many who would prefer a mechanical carriage to horse traction, and who are prepared to pay, say, from five to seven hundred dollars for a reliable vehicle, and the maker of the motocycles who first produces a really reliable carriage and offers it at the prices mentioned should strike an extensive trade.

The particulars of the Orient two-seated four-wheeler (Fig. 1) are as follows: Weight, 1,000 pounds, price, $1,000; range, 25 miles; weight of battery, 550 pounds, by the Chloride Company, of Philadelphia; wheels, 32 and 24 inches diameter; wheel base, 60 inches; gage, 48 inches; tires, Morgan & Wright, 4 inches diameter; air pressure, 100 pounds; cost, $100 for a set of four. The wagon is driven by a Riker motor, 8-10 of 1 kilowatt, weight 100 pounds. The gear reduction from the motor shaft to the compensating gear disk is 8 to 1. The compensating gear is of a new design by President Metz, of the Orient Company, Waltham, Mass., and is said to possess important advantages. The frame of this wagon is very similiar to the frame of the Stanley steam wagon; the middle part of the upper side bars are fitted to turn in the end portions, thus giving the frame sufficient flexibility to enable the wheels to readily accommodate themselves to ordinary variations of road surfaces. This weight of battery, 550 pounds, is very small for a four-wheeled vehicle, and the extreme lightness of the running gear and carriage body, bringing the total weight down to 1,000 pounds, makes a vehicle much easier to drive than if it weighed twice as much, as most of the electric carriages do. The maker's statement is that this wagon has a range of 25 miles with once charging. This Orient electric has pleasing outlines and is very well finished.

FIG. 1. THE ORIENT ELECTRIC CARRIAGE.

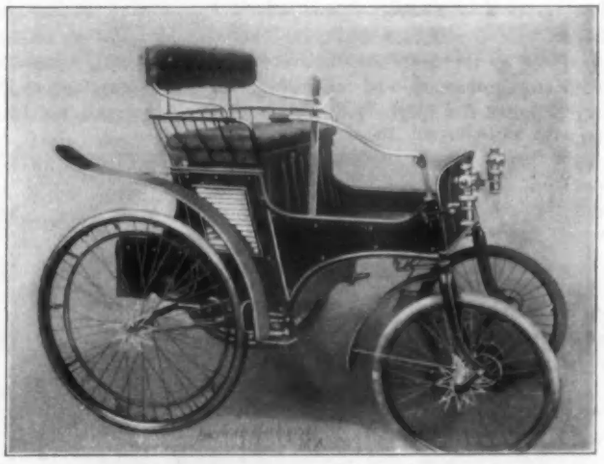


FIG. 2. THE OAKMAN-HERTEL MOTOR WAGON—SIDE VIEW.

The Hertel wagon, built and exhibited by the Oakman Motor Vehicle Company, Greenfield, Mass., is the result of something like six years' hard work on the part of Mr. Hertel, its designer. Hertel showed at the "Times-Herald" contest at Chicago, 1895, a very light vehicle, weighing only about 225 pounds, on the same general lines as the carriage shown in Fig. 2. This 1895 wagon seated two passengers, but was altogether too small and too light for comfort or for successful road use. The novel features shown in the 1895 Hertel wagon are retained in the present vehicle, which weighs about 475 pounds, and is offered at $750. The general design of the frame is similar to that which would be produced by tying two bicycles together side by side. Each wheel of the wagon is, however, mounted on the free end of a pivoted lever controlled by a spring, so that any one of the four wheels of the wagon can rise and fall through a considerable distance independently. This is a novel feature, and it is also a feature which appears to possess great practical advantages. Another feature of the design of this wagon which is of the greatest practical value is the very complete exposure and accessibility of the engines and the entire driving gear, instantly obtained by raising the sheet metal tail-board of the wagon.

FIG. 3. THE OAKMAN-HERTEL WAGON—REAR VIEW.

Fig. 3 shows the rear view of the Hertel wagon with the tail-board down.

Fig. 4 shows the Hertel wagon with the sheet metal tail-board raised and supported by the rule-joint-pivoted levers on each side. When the tail-board is so raised, the whole of the machinery is fully exposed and completely accessible at a hight convenient for work. This is in very strong contrast to the driving mechanism arrangements of most explosion engine-driven vehicles. In many of these wagons the machinery is so located as to be inspected and operated upon only by a person lying flat on his back under the wagon. There really seems to be no excuse for the awkward and inaccessible driving mechanism arrangements which have hitherto been the rule in motocycle constructions. The motor is a pair of cylinders cast in one piece, and their connecting rods taking the same crank wrist. The bore is 3⅝ inches, stroke 4¾ inches, and the clearance is 2½ inches, or something over one-half of the piston displacement. This gives a very low initial pressure, probably not to exceed 125 or 130 pounds. Mr. Hertel did not himself know exactly what his initial permanent pressures were. The low initial pressure has

the effect of reducing the probability of premature explosion, and also makes an easy running motor. The cylinders are water jacketed over the piston-ring travel only, the explosion chambers being left naked to take what temperature they may obtain; the intention being to simply keep the cylinders at a temperature low enough for efficient lubrication. This wagon carries only six gallons of cooling water, the tank being so arranged with reference to the cylinder jackets as to insure a rapid circulation. Mr. Hertel said that the temperature of the cooling water never reached the boiling point, and that there was consequently no necessity for replenishment. The ignition is electric, from a dynamo driven from the engine shaft; the current generated by the dynamo is delivered to a small storage battery, and the storage battery supplies the sparking currents. The storage battery has a capacity of 8 ampere hours, thus making the spark delivery certain whether the dynamo is operating at the instant or not. The weight of the dynamo is 22 pounds, and the weight of the storage battery is 14 pounds. The counter-shaft, which carries a 24-pound fly-wheel, is driven by a 3-inch 10-pitch spiral pinion, meshing with a 6½-inch spiral gear on the engine shaft; the gear being 1½-inch face, and the angle of spiral such that one end of the tooth is fully engaged while the other end is free. This gear is said to be quite noiseless in action. The counter-shaft, thus driven at something over twice the rate of the engine shaft, carries on each end a V-friction pinion, 3 inches diameter, which internally engages a leather covered V-ring, which is secured to the driving wheel, as clearly shown in Fig. 2. The V-shape on the ring and groove, taken in connection with the leather covering of the large diameter ring secured to the driving wheels, makes this friction drive efficient with a very small pressure. The total gear reduction is about 4⅓ to 1. The wheels are 26 and 36 inches diameter, wire spoke suspension, with steel rims and ball-bearing hubs and 2⅛-inch pneumatic tires. The gage forward is 33 inches, and in the rear 45 inches. The wagon will turn in a circle 10 feet in diameter. There are no gear changes, the speed changes being made by varying the charge of explosive material, by which means the engine revolutions can be varied from about 160 to 800 per minute. The brakes are rubber-faced friction blocks applied to the rear wheels by means of an upright lever in front of the seat, shown in Fig. 2. The explosion charge is varied by turning the handle of this vertical lever, which is mounted on a quick-pitch screw. This particular carriage is now arranged for a reverse motion; but it is the intention of Mr. Hertel to make his carriages generally with a backing action. The price of this carriage is low, the weight is very light, and the fuel expense is said to be something less than one-third of a cent per mile. The range with a single charging of the fuel tank is about fifty miles.

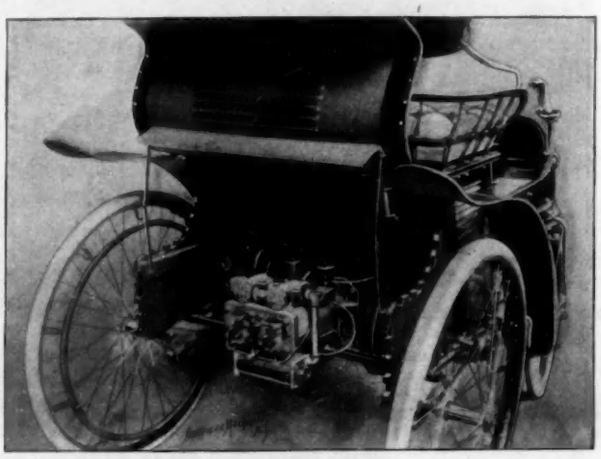


FIG. 4. THE OAKMAN-HERTEL WAGON—TAIL-BOARD RAISED.

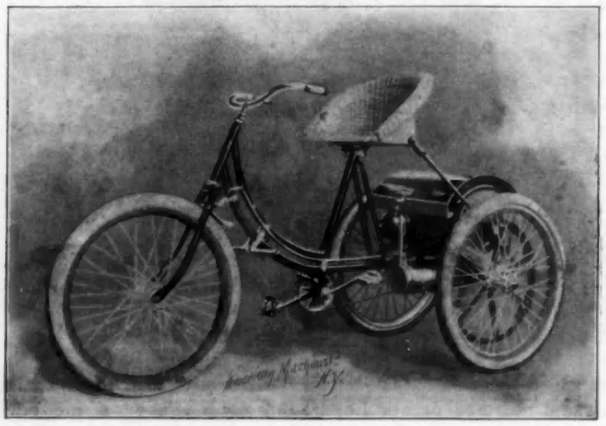


FIG. 5. THE TINKHAM TWO-CYCLE MOTOR TRICYCLE.

The third new motocycle shown was a new tricycle by the Tinkham Cycle Company, of New York, an illustration of which is given in Fig. 4. This wagon is driven by a new explosion motor working on a two-stroke cycle, or, as it is commonly written, a two-cycle. Two-cycle explosion motors have been previously shown, but none of them up to the present time have exhibited such certainty in action as to have obtained great favor. The motor consists of two cylinders located on opposite sides of the shaft, having no puppet-valves, a single disk-valve secured to the engine shaft and revolving constantly therewith effecting the distribution. The wheels are 28 inches; tires, 2¼ inches; price, $15 for a set of three; wheel-base, 54 inches. The gearing is from five to fifteen miles per hour, and the fuel cost is said to be one-third of a cent per mile. The price is $500.

The behavior of the spectators at this Madison Square Garden show greatly strengthened my previous belief in the general interest in the motocycle. The crowds which continually gathered about each motocycle exhibit evinced the most eager desire for information, and many by their comments evinced a full and critical knowledge of the types of automobiles which have been more prominently presented to the public. There is no question about the market for motocycles; it is made. The thing required now is a vehicle to meet the practical demands in efficiency, reliability and price.

HUGH DOLNAR.

American Shipbuilding.

In discussing the American iron, steel and shipbuilding industries, "The London Statist" says:

"Perhaps the most important economic question of our time is connected with the development of the iron and steel industries of the United States, and the probable consequences of that development, not only on the cognate industries of Europe, but also on the whole maritime relations of the commercial world.

"We are, indeed, apt to forget that America once divided with us the world's carrying trade, if, indeed, for a time she did not have the lion's share. It is only since the age of iron that she has lost that position, though she need not have lost it had not the fiscal policy that has developed since the civil war prevented her both from importing material wherewith to build ships at a profit, and also from buying ships from foreigners, except under practically prohibitive conditions.

"And now we are face to face with two momentous facts that presage a revolution in the world's shipping and a formidable competitor with Great Britain as the world's common carrier. These facts are (1) that the people of the United States have now become impatient of their stifling navigation laws, and are craving for a national merchant navy, and (2) that now, for the first time in their history (since the decline of wooden ships) are the Amer-

icans able to produce shipping material on a competitive level with Great Britain.

"It is probable that Congress will soon revise, if not repeal, the navigation laws. Leaving, however, the fiscal aspects of the question for the present, we propose to take a rapid view of America as an actual iron and steel producer, and as a prospective builder of high-class modern iron and steel vessels. In the first place, we have to note that the United States has not yet reached its maximum power in the production of pig iron. Its furnaces are much larger than ours, and its proportion of obsolete types must be small, indeed, compared with the number of antique examples we have still standing in England, Scotland and Wales. At any rate, its existing furnaces are computed to have a capacity of over 1,000,000 tons per month.

"The actual production has not yet reached that capacity, and there is, of course, no limit but that of capital to the number of new furnaces which may yet be built. Can such enormous quantities be produced as cheaply as in Britain? The truth seems to be that in the more favorably situated works of the United States, and with the more economically worked furnaces (which are three or four times the size of ours) the prime cost of American pigs is below that of either Scotland, Cleveland or Cumberland in the respective qualities. Experienced iron manufacturers with whom we have conversed have expressed their belief that the Southern States of America and those of the Northern States that are within easy reach of the lake ore, can certainly smelt pigs more cheaply than we can.

"And in all stages the Americans have the advantage of cheaper fuel. Barring India, American coal is now the cheapest in the world, and on the average is to the industrial consumer fully 3d. per ton cheaper than the average in England, Scotland and Wales.

"It is also a noteworthy fact that wages in the American iron industry have been materially reduced of late years, while the producing capacity has also increased.

"Now, take another fact in relation to the American iron industry. Until within recent years that industry practically depended on the development of the railway systems of the States. When railway building was slack the iron industry was depressed, and *vice versa*. But of late years, while railway building has shrunk to insignificant proportions, the production of all kinds of iron and steel has enormously increased. Of course, this means that producers of American iron and steel have found new and larger outlets for their material in other industries than railway building.

"The point we have sought to bring out is that America has now so developed her iron and steel industries that she must find fresh outlets for her products. Such outlets she is finding, as we believe with profit, in foreign markets for certain products. For other products, however, she will need to create a new shipbuilding industry of her own; and what has been done or is being done in that connection we must reserve for future examination. No thoughtful man, acquainted with the American character, who considers the situation can fail to perceive that the greatest competition to be faced by British industry and enterprise in the future is that of American shipbuilding. It may be deferred a few years, but it is bound to come."

Shop Talks—Brow-beaters.

BY NED WILSON.

If there is one individual I have less use for than any other, it is a brow-beating, nigger-driving foreman, superintendent or manager. When I see a foreman watching his men with an ugly frown, ready to jump down some poor fellow's throat at the slightest provocation, it makes me feel like giving that foreman a double dose of his own medicine. There is perhaps one lower order of being, and that is the boss who employs a spy. And when these two traits are combined in one foreman, I wouldn't give a cigarette for his chance of passing the golden gates. There are some foremen who have not sand enough to pay no heed to the tale bearer. Old John Gorman of the "Z" shops used to let the tale bearer finish his story, and then he would say to him:

"Now, my friend, I don't believe a word of what you have told me, and if ever you run to me with such a tale again, I'll fire you so quick it will make you dizzy."

It is needless to say that no tales came to old John twice from the same source.

I believe it to be a fact that about nine times out of six the tale bearer is either a loafer or butcher, and quite frequently both. He is a dangerous man to have about the shop, for he will take many occasions to stir up trouble. The tale bearer is usually not a spy, although he will become a spy if given sufficient encouragement. The spy is often an uncertain quantity. He may have a petty grievance against one of the men, and if he can find no basis for a complaint about the man, he is quite likely to make up something from his imagination.

It is the foreman's business to discover the wrongdoers himself. If the shop is so big he can't run it alone, he should have an assistant foreman, or several if necessary, but not a lot of "supes." It is of no use, either, to treat a man like a beast. Harsh language just as often makes a workman nervous and causes him to spoil his work. The foreman who corrects his men without flying into a passion and attempting to take the tops of their heads off, will always get more and better work from them.

If the brow-beater relieves his mind with a few by-words it may be picturesque, but it is scarcely in keeping with good, sound judgment. There is impressed upon the writer's memory a very distinct recollection of a pit boss, for whom he worked when a cub in the shop.

"Who screwed up the nuts on that front cylinder head?" he asked me one day.

"I did," was my answer.

"Go and give them all another turn," he ordered.

He had not been near that cylinder head since it had been put on, and I began to get a little bit warm under the collar.

"The nuts are all up as tight as they will go," I told him.

"You blankety blank, go and screw them up at once," he yelled.

Now, boys, what would you have done under the circumstances? Punched that pit foreman's head? Yes, that would have been about right, if you were the larger man. I felt, myself, like throwing a whole box full of tools at him. Well, I didn't screw up those nuts any more, nor did I do anything else for that pit boss. I simply went to the foreman and asked him for another job.

There is also another sort of a despicable specimen of a human being, and that is the foreman who lies. As an example of the habits of this breed of animal, the following case could be cited.

Johnny Finch was turning up some jack screws one day and at the piecework gait of three in an hour. Bill Brown, the foreman, came and stood by the lathe, and after watching Johnny until he got nervous, asked "How many are you getting out an hour, Johnny?"

"Three."

"I have a man who can get out five an hour."

"That man's dead, isn't he, Mr. Brown?" said Johnny, keeping back a smile.

The question floored Brown completely. He looked at Johnny, scowled, and then walked off down the shop, spitting tobacco juice until he appeared like an engine with her pet cocks open.

All hail to the foreman who has all the instincts of a man, to the foreman who remembers that those under him are also men, to that one who is quiet in his manner and who, above all things, can control his temper. Slavery was abolished a quarter of a century ago, and the occupation of the nigger driver is, or should be, a thing of the past.

Die Construction.

BY GEO. B. PAINTER.

The combination shearing, piercing, bending and forming die shown and described in this article, illustrates a principle that is applicable to a large variety of press work. The die, as shown, is provided with an automatic feed attachment that is simple, self-contained and positive in its action, and does not require any elaborate press connections. Where the

production is not large enough to warrant the expense, this feed may be dispensed with, and the stock may be fed to the die by hand, without detracting anything from the exceedingly good qualities possessed by the action of a die of this kind.

Referring to the drawing [reproduced one-half size—Ed.], Fig. 4 shows the piece to be made, a piece that the diemaker will recognize as a very annoying and difficult piece of bending; annoying, because of the difficulty of gaging the various operations when performed separately. The die illustrated will produce an article of this description complete in one operation, and the pieces will be duplicates.

Fig. 1 in the drawing is a side elevation; Fig. 2 is an end elevation; Fig. 3 is a plan of the die and die-bed with stripper gage removed. *M* is a die-bed slotted to receive a slide *P*, the shearing, piercing and bending die *K*, and the forming die *I*. The forming die must be the same width as the piece to be bent. The shearing, piercing and bending die must be at least ¼ inch wider than the stock from which the piece is made. The shearing and piercing and the bending of the small lugs shown in Fig. 5 are accomplished by the shearing punch *C*, piercing punches *D* and the shearing and bending punch *E*.

The die ahead or to the left of the punch *E* is channeled on a bevel, as shown in Figs. 1 and 3, so as to offer no resistance to the forward movement of the strip after the lugs are formed. The channel must not extend to the edge of the shearing die *K* that is next to the forming die *J*, as this cutting edge must be kept the full width of the strip.

The dotted lines near the bottom of the punches *C* and *E* show the cutting and bending faces, as in order to stand up to their work these punches should enter the die-bed and be backed up by it before the action of shearing or bending takes place.

Between the bending punch *E* and the shearing edge G^1 it will be necessary to leave the length of one full blank in order to utilize the pilot pin *F*, which is indispensable. The forming punch *G* has a backing plate *H* beveled at the bottom. The forming die *J* has a similar plate *I* on the opposite side. The punch *G* and the die *J* being the same width as the finished piece, it is brought to its place and confined, thus assuring uniformity in this direction. The piece G^1 which shears the article from the strip is made separate to allow repairs to be quickly made.

The knock-out *N* is beveled upwardly from the face of the die *J*, and is held out by means of a spiral spring kept in place by means of the screw N^1. When the stock is forced down into the forming die, the knock-out is forced back into the slot. When the pressure is removed, the finished piece is dislodged by action of the knock-out, and the press being set on an incline, the pieces fall out by gravity.

Perfect uniformity is assured in a die of this kind, from the fact that the strip is held by the action of the pilot pin *F* until the forming operation is almost complete, the shearing of the finished piece from the strip being almost the last thing that takes place.

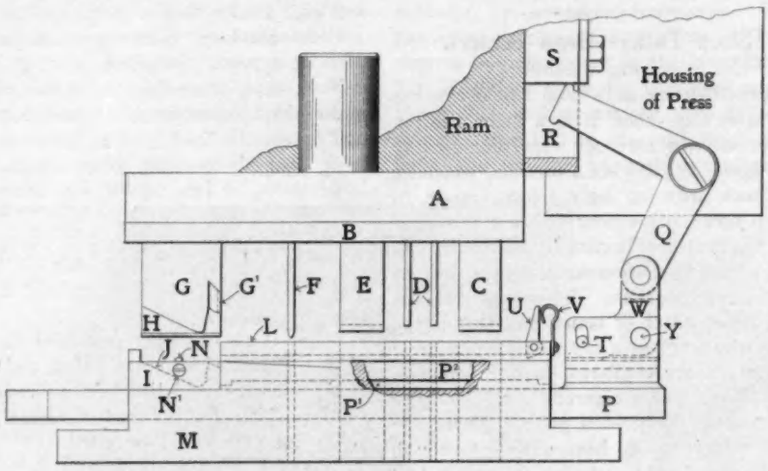


Fig. 1.

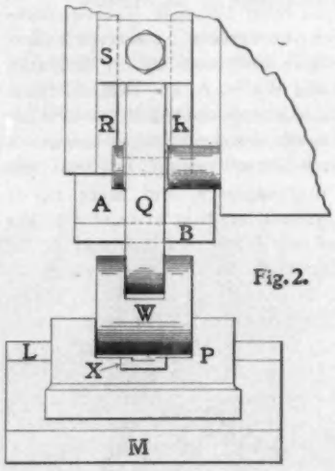


Fig. 2.

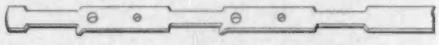


Fig. 5.

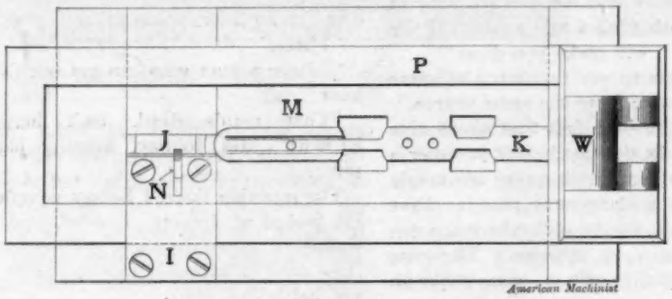


Fig. 3.

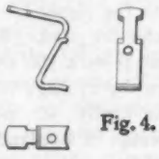


Fig. 4.

A COMBINATION SHEARING, PIERCING, BENDING AND FORMING DIE AND ITS WORK.

The automatic feed shown is, I think, somewhat novel. I have designed several dies with similar feeds, all of which are in successful operation, taking the strip from a reel. The production runs from 18,000 to 60,000 pieces each per day of ten hours.

Fastened to the side of the ram of the press is a U-shaped piece *R*, which is adjustable up and down and is held in place by the clamp *S*, which is slotted so as to be also adjustable. This arrangement allows the feed to be adjustable to a nicety, which cannot be done with a roll and ratchet feed. Imagine the ram of the press on its downward stroke, the clamp *S* just engaging the lever *Q* which works on a stud in the housing of the press. Further downward movement of the ram results in raising the forward end of the grip *W*

which is hinged in the slide *P*, until further upward motion is arrested by the pin *T* coming in contact with the top of the slot. Continuous downward movement of the ram then carries the slide back until the crank of the press goes over the center and the upward stroke commences. The piece *R* then engages the lever *Q*, bringing the grip *W* down and clamping the strip of metal between it and the piece *X*, which is hardened to stand the wear. Continued upward movement of the ram moves the slide forward carrying the strip of metal. The amount of friction necessary to obtain the grip of the piece *W* is furnished by fiber strips P^1 placed on top of that part of the slide that works in the die-bed; adjustment being obtained by means of set screws (not shown) through the stripper plate *L* on to the filling pieces P^2. The eccentric *U* which is held down on the strip of metal by means of the spring *Y*, is to prevent the strip from being withdrawn on the outward stroke of the slide. Its action is made sufficiently plain by the drawing.

I am much in favor of the practice of using strips of metal and shearing out the sides to form blanks of irregular outline. It reduces the amount of scrap to a minimum, and in cases where a large production is needed, it pays to combine operations wherever possible.

The Coupling of the Cable Wires of the Brooklyn Bridge.

BY O. C. CRANE.

The card of sample wires in the half-tone herewith shows the various stages of the coupling of the wire which formed the main cables of the Brooklyn Bridge. Interest in the matter may be somewhat revived, as the new East River Bridge, now being built, is to be on the same general plan.

Sample No. 1 is a piece of cable wire with the end threaded and screwed into a coupling. The ends of every coil of wire (coils measure about 700 feet in length) were cut one right, the other left hand, and the couplings were tapped to correspond.

Sample No. 2 shows the ends of the wire in the coupling, which has been cut away to show more plainly the *beveled ends* of the wire.

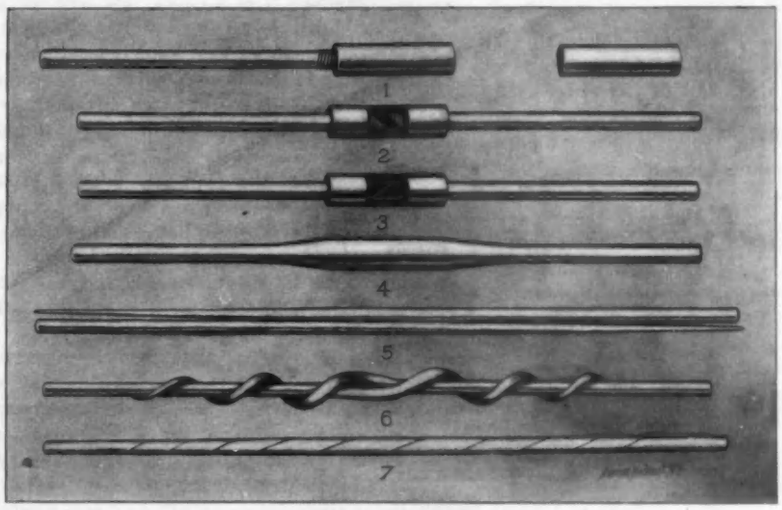
No. 3 shows the ends of the wire brought close up. With the beveled ends and the right and left threads, it is apparent that neither end can be unscrewed separately. The only way to disconnect is to hold both wires, and then turn the coupling like any turn-buckle. This was done to prevent the wires from unscrewing, which they did before the ends were locked by being beveled, and consequently sometimes fell into the river while being run across by the traveler.

No. 4 represents the coupled wire, with zinc galvanizing at each end of the coupling tapered down from the coupling to the size of the wire, to completely cover the exposed parts, and also to facilitate the running out of the wire in making the cable.

No. 5 shows two ends of the wire used in wrapping the cables, which were tapered to a slim point, in order to connect to the next coil.

No. 6 shows the ends coiled together ready for the swaging operation, which was done cold, and the joint when finished was as seen in sample No. 7, the whole joint being thoroughly galvanized. This wrapping wire which covers the cable was practically one continuous piece from the towers each way, meeting at the middle of the span.

It may be noticed that the screw thread on the wire was tapered from full thread to nothing at the finish. The couplings were tapped and reamed to correspond. This style of coupling was so perfect that the breaking strain of the coupled wire was from 87 to 95 per cent. of the wire itself, and in a few samples better than that.



THE WIRE SPLICES OF THE BROOKLYN BRIDGE.

The machine for drilling and tapping the couplings was a somewhat complicated affair. The base was made to hold the dripping, with one set of drill, reamer and tapping spindles, arranged on each side of a circular disk having eight clamps for the coupling blanks, equally divided on the circumference, and with the drill, reamer and tap spindles set in corresponding positions.

The drills, one right and the other left hand, were made to feed towards each other by a cam motion, backing out the drills twice before meeting to clear the chips and to get oil. Then one drill backed out entirely, and the other finished the hole clear through. At the same time the next coupling in the disk was being reamed taper, operated by the same cam feed, while the third coupling was being tapped right and left; all working automatically, the taps backing out and stopping independently of the other parts. When the last tap backed out, the whole machine stopped. The attendant had meanwhile changed the coupling last finished for a blank coupling, and then had only to turn the circular disk one space and start the machine again. One hundred and twenty thousand couplings were finished in this machine.

As each coil of wire was coupled to the last coil, it was wound onto large wooden drums ready for the traveler to carry the bight of the wire across the river from Brooklyn to New York, where it was laid over the shoe prepared for it. While this traveler was returning, the traveler on the next cable was carrying a wire across in similar manner.

Each cable has 5,296 parallel galvanized, steel, oil-coated wires; the whole covered with wrapping wire into a solid cylinder 15¾ inches diameter. There were 14,361 miles of wire required for the four cables.

[The above is interesting and valuable as a fragment of ancient mechanical history. Since the Brooklyn Bridge was begun and finished our ability to do things neatly and effectively has developed vastly. There is nothing, perhaps, more certain than that no wires would to-day be joined as here shown. Of course electric welding would be employed throughout, giving greater strength and security, and avoiding almost entirely the very objectionable swell in the wire.—Ed.]

The Russian railroad report gives the number of journeys made on free passes in that country, which in 1895 was 2,202,929; and one man traveled on a free pass to every twenty-five who paid. This was only one-third of the free travel, however, for nearly four millions of journeys by soldiers, and nearly half a million of prisoners paid no fares. Altogether there was one non-paying passenger to every eight who paid. Only about 1½ per cent. of the passengers carried travel "first class."

Letters from Practical Men.

Dynamic Force Exerted by Drop-Press Hammers.

Editor American Machinist:

I received a very handsome catalog the other day, containing illustrations of drop hammers and other things. I find in it a table of the "Dynamic Force Exerted by Drop-Press Hammers," which is introduced as follows:

"The following table gives the force produced by a solid, compact, iron body, weighing one pound, falling freely through space. To find the force exerted by a hammer of known weight, multiply the weight of hammer by force produced by one pound falling same distance. This table has been computed on the principle that falling bodies pass through the same space in the same time, without regard to the weight, and the spaces through which they fall at different periods are as the squares of those periods.

"The space through which they fall the first second of time is 16 feet, and the speed acquired during any length of time is at the rate of 32 feet for each second."

The table gives the hight, time in seconds, velocity in feet, and pressure and pounds for each inch of fall up to 36 inches, but the following is sufficient to show the nature of the table:

Hight Feet.	Time in Seconds.	Velocity in Feet.	Pressure in Pounds.
1	.25	8.	35.5
2	.353	11.314	50.205
3	.435	13.856	61.488

By dividing the figures in the last column by those in the next to the last it appears that the pressure in pounds is 4.4375 times the velocity in feet. A remarkable fact, if true.

The same subject is treated briefly in Kent's Mechanical Engineer's Pocket Book, page 430, under the heading "Force of the Blow of a Steam Hammer or Other Falling Weight," as follows:

"The question is often asked: 'With what force does a falling hammer strike?' The question cannot be answered directly, and it is based on a misconception or ignorance of fundamental mechanical laws. The energy, or capacity, of doing work, of a body raised to a given hight and let fall cannot be expressed in pounds simply, but only in foot-pounds, which is the product of the weight into the hight through which it falls, or the product of its weight ÷ 64.32 into the square of the velocity in feet per second, which it acquires after falling through the given hight."

The table in the catalog and the statement in Kent's Pocket Book do not agree. Which is right? MECHAN.

[The question of our correspondent does not require a formal answer, as it must be self-evident to our readers. Mr. Wilfred Lewis stated the matter in our columns in 1890 as follows: "It is just as absurd to speak of a blow of so many pounds or tons as it would be to speak of a yard of milk or a quart of steel rails, because weight is no measure of work, and the blow struck by a hammer can be measured only by the work it can do. In English-speaking countries the recognized measure of work is the foot-pound, and the blow of a hammer should always be stated in foot-pounds to have any meaning at all."—Ed.]

Marking Sizes on Drills.

Editor American Machinist:

The letter from "Odd" in your issue of February 2 will serve a good purpose if it brings about a better way of marking straight shank twist drills, but I do not believe the plan he suggests would be practical, because of the difficulty of marking the size in the groove rapidly or plainly, two points of importance to the manufacturer. I fancy I hear someone saying: "Use a chuck that will not allow the drill to slip." But although there may be chucks of that kind it is often impossible for those who use the drills to obtain them, and, too, it is an advantage sometimes to have the drill turn in the chuck and avoid a break. Some time ago I adopted the plan of marking straight shank drills on the end, first filing or grinding the end flat. This way has two advantages over the method in use. The mark is not destroyed, and it is easily found and read, for it is not necessary to turn it around until the figures are right side up to be able to read it. It seems as if drills could be marked this way about as cheaply as they are with the process of rolling now in vogue. Perhaps some manufacturer of drills will tell us why this way has not been adopted. W. R. G.

The Cox Computer.

Editor American Machinist:

I notice in "American Machinist" of 9th inst. a communication signed J. F. Bradley, respecting the applicability of my "pulley and gearing" computer to the solution of the bicycle-gear problem. The reason for this is very simple, namely the similarity of the two formulæ, each one being an example of indirect proportion. Thus we have in the one case:

Diameter driver × revolutions driven = diameter driven × revolutions driven;

while in the other we have:

Diameter of wheel × teeth in large sprocket = gear × teeth in small sprocket.

The computer may be similarly used for any other formula of the same nature, within, of course, the limits of the scales.

All machinists are not bicyclists, and it may be that many of those who are have already discovered that this computer can be used to solve many other problems than the one for which I originally designed it.

J. F. Bradley omitted to give the diameter of the wheel, viz., 28 inches, when showing how to find the gear.

WM. COX.

Elizabeth, N. J.

The Type Dovetailing Job.

Editor American Machinist:

In your issue of January 26, Mr. Walter Gribben describes a "type dovetailing job," and gives a very ingenious, though to me not a satisfactory, way of doing the work. In 1896 I was working on a model power typewriter for the same company, and milled the type-wheels and type. The first method suggesting itself was that which, unknown to us, Mr. Gribber had used; but after due consideration it was discarded, and I proceeded under the direction of B. M. W. Hanson, who had charge of the work, to use the end-mill method.

The slots were the same as Mr. Gribben's, except that they were .04 inch deep, .12 inch wide at the bottom, and .01 inch offset from the radius. There were three sets of wheels, six in all. I made three roughing dovetail mills .116 inch across the corners, and three dovetail finishing mills exact size. Then we saw to it that the index head of our milling machine was in proper shape, as the work had to be correct and we were not taking chances. That done, the wheel was mounted on a solder chuck by the rim, and after getting the index-head spindle in line with the spindle of the machine, the chuck was placed in the head. A roughing mill, after having been ground true, was put in the spindle, and we were ready to mill. The table was first lowered .01 inch for the offset, then the mill was brought up to the

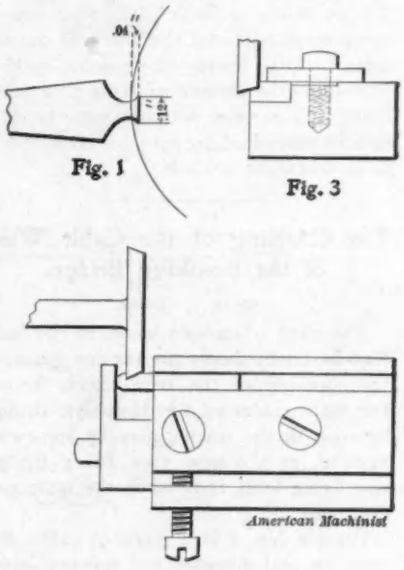


Fig. 1 Fig. 3

Fig. 2

A TYPE DOVETAILING RIG.

rim of the wheel, the graduated collar on the cross-slide screw set to 0, the work drawn to one side, and the mill fed in .04 inch. After that the mill was run through the rim of the wheel and back, as in Fig. 1, and the wheel indexed for the next slot, and so on. The same operation was gone through with the finishing mill. Each mill was used for two wheels, and after being put through 80 slots each they showed no appreciable wear. The slots were, as to size and position, practically perfect, and as to finish smooth and clean cut.

In milling the type a 70-degree cutter was made with the sharp angle toward the shank, and a little block was slotted and fitted with a piece of flat steel so as to make a miniature vise. The latter had a swivelled stop on the end and was placed in the milling-machine vise with the stop towards the spindle. The type was put in with the side to be notched next the solid side of the block, so that the cuts would come exactly alike and all the type could be milled at one setting of the mill. The cutter was set so as to make a notch .06 inch from the face of the type, and running out .10 inch from the face. The feed was up and down. Of course the wide type had to be milled on both sides, and a gage was made to mill them to, with the same cutters used on the wheel. After milling all the type we sawed it off the proper length.

For the wedges we used a jig, shown in Fig. 3, in which wide spaces (quads) were clamped and milled lengthwise, so that the edge would fill the space between the edge of the wheel slot and the side of the type. All of each size were milled at one setting. Then they were sawed off .04 inch thick.

In setting the type the wheel rims were faced true, and after starting a piece of type and a strip of wedge, the wheel was laid on a surface block, the type forced down to the block, and the wedge cut off. There was no doctoring of any kind required and everything lined up in the machine perfectly.

EUGENE A. JOHNSON.

Hartford, Conn.

Hinge Dies.

Editor American Machinist:

In presenting this paper to the readers of the "American Machinist" the author is well aware that in treating the subject of dies volumes could be written on this peculiar but interesting branch of mechanical art.

From the countless varieties of articles produced by them there is always some varied form and unique feature or "kink" that taxes the ingenuity and skill of the expert to turn out the work satisfactorily.

In this article I do not claim originality, but aim merely to place before my fellow workmen such knowledge as I have gained by practical experience while recently constructing a set of these tools for producing plain hinges.

There are two distinct forms of hinges in use, and numerous modifications, probably all derived from these two styles. The first is where the joint stands out equally on both sides, and the other is

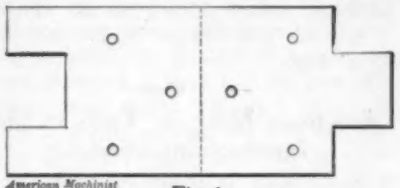


Fig. 1.

HINGE PUNCHED.

where it is placed on one side only. It is of this latter style that this paper treats.

The two parts were perforated and blanked out in one piece like the sketch, Fig. 1, in order to save stock and gain time, for by this method there is practically no waste.

In the next operation we separated the

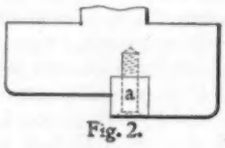


Fig. 2.

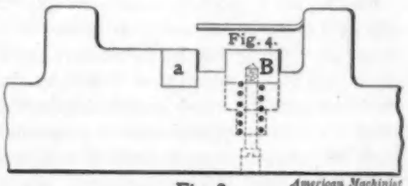


Fig. 3.

FORMING DIE AND PUNCH.

two parts of the hinge and formed the end. Figs. 2 and 3 are the parting and forming punch and die, which we made of cast iron; *a a* are inserted pieces of tool steel for cutting; *B* is a pressure plate for removing the lower half from die. The work after passing through this operation

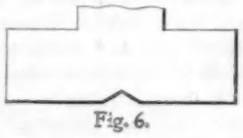


Fig. 6.

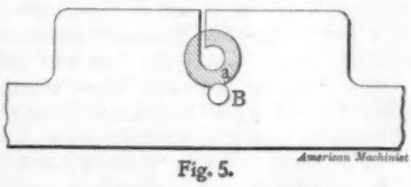


Fig. 5.

ROUNDING DIE AND PUNCH.

resembles in form Fig. 4. For making hinges or butts the parting die should always be used, as there will be no loss of stock.

The work is next placed in a vertical position in the rolling die, Fig. 5. The die is made of cast iron; *a* being tool steel, hardened and lapped in order to make the hole smooth for rolling. Pin *B* holds *a* in position and prevents turning. Fig. 6 is the punch, which requires no explanation. The work may be removed from the rolling die by a hand lever which forces a sliding pin through the die, or by an attachment operated by the press.

As the fit would be too tight if the

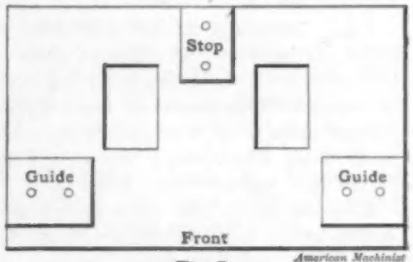


Fig. 7.

TRIMMING DIE.

hinges were put together after passing through the rolling stock, trimming dies, Figs. 7 and 8, will have to be added to broach or trim the ends. The two parts are then ready for assembling and the counter-boring of the holes for screws.

DIE MAKER.

Lynn, Mass.

Are the Machinists at Fault?

Editor American Machinist:

I am a constant reader of the "American Machinist," but this is my first attempt to write for publication. I cannot help answering "Superintendent's" letter of December 29. We must all admit that some of our craftsmen ought to be "knights of the road," but they are the exceptions. I think that most of us do our duty to our

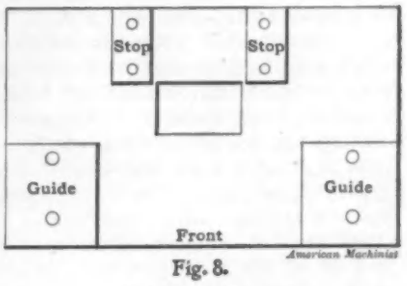


Fig. 8.

TRIMMING DIE.

employers, especially if we know we are appreciated a little. I saw a case of it last month in the shop where I work. A boy works there who has been at the trade about two years. The proprietor gave him a hurry job one day, and the boy made a very neat and quick job of it. The boss came to the boy and complimented him on it and raised his pay a dollar a week. I am sure the proprietor and the boy will both be benefited by it, as the boy works much harder since then. If any of the

men do a job that is a little nice, there is always a pleasant word for us, which shows us we are appreciated. I think all of the men in our shop do their duty as employee to employer should. If "Superintendent" would follow the example of my boss he would find little cause for complaint. B. C. F.

Steam-Driven Road Carriages.

Editor American Machinist:

I was interested in the description of steam carriages in your valuable paper of December 1. I would like to see engineers or others who are interested express their opinion as to what objection there would be to using a compound engine in place of the two high-pressure cylinders.

I would think the compound engine would be the best, as you could get the power with less consumption of fuel and water. A by-pass valve could be used to admit live steam into the low-pressure cylinder, to increase the power, when occasion required, such as when going up hill.

Mr. Wm. H. Harrison in his letter in the issue of December 15, commenting on the pneumatic tires, thinks that steel rims, or tires, would be better. But if he will read the account of experiments carried out on different kinds of wheels, or tires, in a book devoted to auto-cars, etc., by Farman, M. I. E. E., published by Whittaker & Co., London (pages 211 to 216), by the Mechelin Company at Clermont, France, he may be convinced that the pneumatic tires are the best.

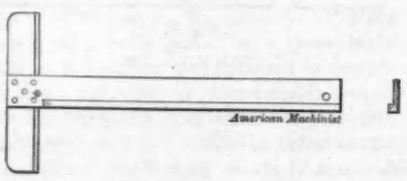
J. D. FULLERTON.

Pictou, N. S.

An Improved T-Square.

Editor American Machinist:

I noticed in a recent issue of your paper mention of a draftsman with a glass triangle. It is indeed a careful draftsman who can use an instrument so fragile, and I hardly think that it will be largely adopted by the fraternity. There is a "wrinkle" in use in our office which is a good one, and I think deserving of mention in your columns. It is a T-square



IMPROVED T-SQUARE.

made as shown in the sketch. The working edge of the blade is slightly thinner than the ordinary T-square blade. The ledge on the lower edge of the blade affords a guide for the triangle when wanted, carrying the triangle above the tracing. The draftsman does not have to wait for a series of horizontal lines to dry before putting in a vertical line. It is especially useful in the structural iron work drafting room where an I or a ⌴ steel beam consists of four heavy horizontal lines. Some draftsmen fan those horizontal lines with a triangle until they are dry, before putting in the vertical lines; but that always makes "the old man" tired. T. D.

American Machine Tools in the Birmingham District.

Our Consul at Birmingham, England, Mr. Halstead, has been investigating the American machinery business in that district, and we extract some passages from the advance sheets of his annual report. They contain information of value to all who are interested in our machinery trade abroad, as, of course, practically every machinery man in the country is interested whether his own work goes abroad or not. Mr. Halstead says:

In a report printed in "Consular Reports" for October, I called attention to the dangerous haste with which American manufacturers granted exclusive agencies for continental Europe and Great Britain, when they were personally sought by well-accredited foreigners who represented houses of undoubted financial responsibility, frequently ready to pay 70, 80 or 90 per cent. on consignments, or even as a tempting bait, "cash f. o. b., New York." I urged that they take time for investigation and satisfy themselves that the motive behind such a proposition was not an intention to control and hamper a possible future competitor, and to buy American styles in merely $5,000 orders, while efforts would be made to sell foreign adaptations of the articles. I stated I knew there was a great deal of such trickery practiced against Americans, and gave an instance.

Consuls warn, warn, warn, until they become very tiresome, and we see that the initial export efforts of American manufacturers are beset with so many difficulties, no matter what plans are formed or directions taken, that we despair of offering suggestions; and American export trade, because of the excellence of our manufactures, is growing so rapidly, despite every obstacle, including bad trading methods, that it will all come right in the end. There has, however, been much dearly bought experience, and the tiresome consular warnings have without doubt saved many Americans from the pitfalls of others in different lines.

Test the first strong house which bids for an exclusive agency. Offer an exclusive contract for a term of years; but retain, in a carefully worded paragraph, the right to supplement the merchant's efforts by sending your own salesmen, who are to work in harmony with the merchant firm, yet to be subject to your orders. Make the commission less when your men are in the field, during the introductory and educational campaign period, and larger when they are recalled; but retain also the right to make the decision when that period shall end. Sell all goods through your agents, and never sneak a commission from them. Live up to the spirit as well as the letter of your contract, and you will have an excellent foreign arrangement. If the goods can be sold, your American salesmen will sell them, and the merchant firm will never refuse a commission; and if they attempt to hinder your business by neglecting to forward goods promptly, or in any other small way, your agent is on the spot and the merchant firm has broken the contract, and you are free from the "exclusive" arrangement.

Most of the successful businesses here in American automatic machinery and pig iron have been built on these lines. The foreign adaptation trick did not work against them, because their own man kept the home houses posted on requirements. One great American concern, which has sold over four thousand costly automatic machines in this neighborhood alone, has the best little machine shop in this city, where it can set up and display machines, and make the tool parts of the American-built machines to suit the requirements of the metal stock used here; yet it still pays some commissions to the big machinery house it originally dealt with, and "all's grist that grinds in its mill."

The great cycle boom was responsible for the introduction into Great Britain and on the European continent of American automatic machinery. Before that boom, an American machinery salesman could not get a hearing, and it was considered impertinent and presumptuous to claim that we could make better machinery than the older nations could. We were not thoroughly aware of it ourselves; had we but realized it, we might have competed for foreign trade in manufactured goods ten years earlier. Ingenious and inventive ourselves, we were also adaptable and imitative, and in our extensive travels we had picked up good ideas everywhere, until we had accumulated the largest store of the world's knowledge in mechanics; and it took the opportunity for comparison offered us at the Chicago World's Fair for us to become acquainted with our own mechanical eminence and power.

The idea that there was even an Old World trade for the United States was realized by machinery manufacturers first; but it was the bicycle boom which gave them the entrée of European factories, and their tremendous sales might have been unfortunate, but for the fact that foreign workmen do not get the results from machines that American workmen do, and that our manufacturers use improvements in machinery more readily than the foreigner. There are many factories in the Birmingham consular dis-

trict which have, in the last two years, put in the first new machinery they have bought in a generation, and it was only the example of the bicycle concerns which stirred them up to do it. Many bicycle firms started to fit out new factories with no antiquated appliances; American machinery was superior and American machinery was bought.

The manufacture of bicycles created a special demand for machinery for rapidly producing small parts, these parts to be accurate so as to permit interchangeability. This demand made an opening in this great bicycle-manufacturing center for various makes of American machines, of both the automatic and the hand types, and hundreds of thousands of dollars' worth were put into factories here with the most satisfactory results. The bicycle trade has passed the high-water-mark period and is settling to a normal business stage; it is thus probable that there will be very little new machinery demanded in this line, and American manufacturers of screw machines are giving attention to general engineering works, where, while there are already many American machines, there is great need for and opportunity to sell many more.

It would naturally be assumed that after such an excellent period of sale, our manufacturers who have been so successful in exporting machinery would have a trade system beyond criticism; but this is not the case, if the testimony of their most experienced representatives is to be credited. These believe that much more business could have been done, and that there is great room for reform in methods; and when I ask them what is wanted, they give, in all seriousness, advice that at first seems intended for an entirely new line of export endeavor. They claim that the heads of even the big machinery concerns consider the export business as the place for the exercise of a little personal vanity, and take it into their special care, with the result that, having other multitudinous duties, much is neglected. They think some one member of the firm should devote himself to the foreign business, in its office side, and keep in close touch with the agents abroad; that one of the expert machinists with wide experience in foreign markets should be called home and put in charge of the construction of all machines intended for export. They claim that an expert machinist who has studied prevailing conditions abroad would in certain cases see the advantage of altering details in construction, and would adapt machines and tools to get better results.

While we were talking about it, one of these representatives said:

"The low grades of the stock and lubricants in general use in this district caused trouble in starting some classes of machines, which arrived here equipped with exactly the same kind of tools they were fitted with for use in our home shops. No class of machinery has been more hampered by the poor stock they were required to work, than the various types of screw machines. The spring chucks used in these machines make it advisable for purchasers to get bar stock which is somewhere near true in section, and comparatively straight in length. In some instances, I have had machine customers who would buy stock true and even in quality and get the very best results from the very start; but in other cases, the stock they wish to use here is such as to make it necessary to alter the style of turning tools furnished with the machines, if the proper amount and quality of work is to be produced. If I have to make alterations after a tool arrives at a shop, it causes an expensive delay and is totally unnecessary, as our builders at home should thoroughly consider the conditions under which the tool will be expected to work here, and should fit it up accordingly. Traveling representatives should be instructed to obtain all necessary details as to materials likely to be used, and when forwarding orders to the home office, should give full particulars for the guidance of those fitting up the machine. It should never be taken for granted that because, with a certain arrangement of tools, the machines give satisfaction in any American shop, the same arrangement will be adapted for foreign trade."

The salesmen complain that the home concerns having practical men in foreign districts do not adopt, as readily as they should, their suggestions as to what will be likely to produce the best results. The skilled mechanics, who come over here from American shops to set up these machines and instruct the operators in their use, are in the very best possible situation to study conditions, and their recommendations should have weight at home.

This tone of complaint and criticism was so surprising, and seemed to me so important, that I obtained the following interview with one of the brightest and best salesmen and most expert machinists I have ever met here. First, he dealt with screw-machine tools as follows:

STOCK UNEVEN IN SIZE.

"In American shops, where round stock is being run in a machine, the bushing box tool is a popular type. For round, true stock, this tool, having a guide bush ahead of the cutting tool, is all right; but this style should never be put into machines coming into this district, unless the builder of the machine is positive that the proper stock is going to be used in it.

"This question of box tools should be carefully considered when fitting up a machine coming to this vicinity. As is well known, to insure good results from a bushing box tool of the type I mentioned before—that is, one having a bushing guide ahead of the turning tool—the material to be run must be perfectly round and dead to size, each bar of stock being exactly the same diameter as the preceding bar; and the bars must be practically straight in length. Where stock containing these qualities is to be used, these box tools will give good satisfaction, as the guide bush, being made to take the stock at a good running fit, will support it steadily while it is being operated on by the turning tool or tools, as the case may be.

"But I know many instances where people putting in these machines have bought stock to run in them which is of such an uneven nature, that it has made the satisfactory operation of box tools of the above type impossible. I could not do anything with them myself. It would not be considered possible to run hexagon or square material in one of these tools and obtain good results; yet much of the stock put into them to run is as near hexagon as it is round. Taking into consideration this fact, that such a large proportion of the bar material used in this vicinity is of a most uneven kind, I would advise our home shops, in fitting up machines coming here, to avoid the use of box tools which have a guide in front of a cutting tool, except in cases where it is absolutely certain that proper material is going to be run in the machine.

STOCK UNEVEN IN QUALITY.

"Not only is much of the stock here uneven in size, but it is uneven in quality as well; that is, in a single bar of material there may be some section that will work nicely in the tool, while the other portions of the same bar may be very hard, or, on the other hand, they are very soft—so much so as to be spongy and to tear out under the cutting tool instead of cutting properly. In cases where very heavy cuts have had to be taken by the roughing box tool, this material of a spongy nature has sometimes torn out to such a depth that the finishing tool would not remove these rough places, and leave a smooth and even surface on the work.

"I have found it necessary in some jobs of the kind to alter the back rests, or steady rests, in the roughing box tool, to allow the roughing tool to take a lighter cut and leave more stock for the finishing tool to remove. By this means, the bad spots caused by the poor stock tearing have been removed, and a good surface left on the finished piece. As these alterations are often necessary, box tools having adjustable steady rests are much to be preferred to those having solid or non-adjusting rests, as in some works here it is a difficult matter to find means of properly making alterations in a solid rest. Of course, with the adjustable kind, it is as easy to set for one depth of cut as for any other depth.

PROPER TEMPER OF CUTTING TOOLS.

"Another point to be carefully looked

after at home is the proper tempering of cutting tools which are to be used here. Many tools, of a degree of hardness to secure the best results on the material run in machines in America, will not "stand up" on some of the stock here, and have to be rehardened. Taps and dies, forming tools and counterbores, etc., should all be hardened with the fact in mind that their work over here will be harder than at home.

BORE CHUCKS AND FEED TUBES IN ENGLISH SIZES.

"Many screw machines have been sent to this district, with chucks and feed tubes bored to the nearest sixty-fourth above the size of the finished model. This is quite right where American bright stock is to be used, as it can be obtained in sizes varying by sixty-fourths, but my experience is that it is practically impossible to find English stock in sizes by sixty-fourths, as most makers of steel vary their sizes by thirty-seconds or sixteenths. As a consequence I have had to replace many chucks with others bored to take a size of stock obtainable here. Some chucks have even come here bored to odd decimal sizes, and this invariably means a delay, and often serious trouble.

ASCERTAIN DEGREE OF ACCURACY REQUIRED.

"Considerable time and expense might be saved in the fitting up of special tools, if the home shop were informed as to what degree of accuracy was required on that particular piece. As a case in point, a manufacturer in this district placed an order with an American firm for an automatic machine to be fitted up for making steel bushes. The representative who received the order, not going into the question as to what quality of work was required, sent the model across to the firm, who proceeded to fit up the job in accordance with its usual custom on that class of work. It arranged the machine to accurately turn the outside of the stock, and finish the hole in center of piece to size, by the use of reamers, and produced work exactly to model. The machine rigged up with the expensive tools and full set of extra tools as well, arrived duly and was put in operation, producing an accurate job. A few days later, the American representative, calling there, noticed that the outside turning tools and the reamers had been removed from the machine, and it was simply performing the operation of drilling and cutting off the bushes. Upon his inquiring as to the cause of the removal of the tools especially made for producing accuracy in the work, the manager of the concern pointed to a row of English hand machines operated by girls, drilling and cutting off the same style of bush, and told him that if he should send work as produced on the automatic, dead to size, along with the work from the other machines to his customers, they would reject all the bushes made on the old machines. In other words, the machine as arranged did too good work for him, and the cost of getting out the special tools might as well have been saved, had the representative been informed as to what sort of a job was wanted.

"And not only would the cost of these special tools have been saved, had the question of the degree of accuracy required been investigated by the salesman, but the machine could have been fitted up much more quickly, and considerable time in the delivery to the purchaser gained. In this case, time meant money certainly, as he could dispose of all the work he could turn out, and every day's delay in the delivery of the machine to him meant a considerable loss. Furthermore, the machine could have been arranged in the fitting up of the tools to have produced a very much greater output per hour, had it been understood at the home shop that the operations of forming and reaming could have been dispensed with. This shows that the representative would certainly not have been wasting time, if he had taken the trouble to inquire thoroughly into all details regarding the use to which the machine was to be put.

MORE TOOLS BROKEN WITH HAND THAN WITH AUTOMATIC MACHINES.

"Builders and users of automatic apparatus who will read what you say in the 'Consular Reports' may be interested to know that in this department was beautifully illustrated the fact that an automatic machine, properly equipped and adjusted, will cost less for repairing and grinding of tools than will these light hand machines, with the class of operators usually put on them in this district. The number of drills and cutting-off tools dulled and broken in each of these hand machines in the course of a day was very great, while in the automatic there was very little trouble of the kind experienced. Of course, the trouble with the hand machinery was due entirely to the fact that operators with little mechanical skill or ability were put on them, and they simply crowded the tools into the work as hard as possible, and consequently the tools were bound to break. Thus a machine which controls the movements and feeds of the tools automatically, has a great advantage over a machine which gives an unskilled operator a chance to crowd the cutting tools."

INSTRUCTIONS.

"What about instructions sent with the machine?" I asked. "Will the firms here read them?" "Oh yes; there is no doubt that books of instruction as sent out by some American firms are of the greatest service, and it is one of the means that all builders of special tools should make use of. A good treatise on a special machine, to be of the most service, should, of course, begin at A and go to Z—that is, it should be written from the standpoint that the workman who is to operate it knows nothing whatever about that class of machine, and all information possible which will assist in the satisfactory manipulation of the machine should be given, along with suitable illustrations showing any parts which are at all mysterious to the unitiated here. The best methods of changing the machine over for new jobs—cutting speeds and feeds—and the best manner in which to make adjustments should certainly be given.

"Some American manufacturers may not, I know, think that any explanation regarding countershafts is necessary; but a little space in a treatise might well be given to counters. Most machine builders have a design of hanger, with the strongest part of the casting where it should be, between the countershaft and the main line. But in a very large number of shops here, these hangers are actually put up the wrong way about, and it is not funny at all, for the pull comes against the weakest part of the casting. That none of them have come down is a pretty good recommendation for American iron. The blue-prints sent by some concerns, for the assistance of those putting up the counters and placing machines, do not show enough and are far from satisfactory.

REASONS FOR PLACING SCREW MACHINES AT AN ANGLE.

"The system of placing screw machines at an angle with the overhead works for the sake of saving space, as we do at home, puzzles many mechanics here, and it is a common thing for them to get the machines set wrongly. American experts who spend their time instructing operators in the use of the machines, are often delayed for a considerable time by the fact that when they go to a shop to start machines, they find them located wrongly. Tool builders would save themselves some expense, if they sent blue-prints showing the relative position of machines and counters so clearly, that there would be no chance whatever for mistake in placing them, even by the thickest headed. The boys at home may think that a workman should use his judgment and go ahead with a job correctly, even though every detail may not be explained; but many workmen are found to be entirely without judgment, and the man who locates a machine wrongly is often the same sort of workman as the one who laces a belt through the ladder he is standing on, and then cuts a rung out to get the ladder down. That this class of men is ever put on to high-class machinery is beyond comprehension, but it is a fact that many men now operating valuable tools have far too little skill and judgment for such work. The matter of detailed instructions cannot be emphasized too strongly, and some of our American builders will do well to consider the matter, if they wish to have their machine used properly, after their

own operator has turned it over to the man who is to look after it."

CAUTION NEEDED IN ESTIMATING OUTPUT.

Agents, not thoroughly acquainted with European conditions, should exercise caution in estimating the output of machines. They should avail themselves of all reliable sources of information, and should profit by the experience of other travelers, who may have had the opportunity of studying foreign methods and customs. All estimates on the product of special machines should be made somewhat lower than what would be the correct figure for similar work in our home shops. As the experienced friend I have been interviewing expressed it:

"A customer will be far better pleased at finding he is getting a higher production than he expected than to find that, owing to conditions in his shop, he is barely getting the estimated quantity from his machinery. For this reason, a traveler new to this side of the water cannot acquaint himself too soon with the quality of material in general use, or find out to what extent skilled labor is employed in the operation of tools similar to those on which he is about to estimate. In no case should an estimate be put at such a figure that the operator need stand with his watch in his hand, wondering whether the second hand of his watch or the cutting-off tool will pass the time limit first."

Concerning Water Gages.

BY W. H. WAKEMAN.

It was formerly the custom, when fitting up water gages for horizontal tubular boilers, to connect each try cock into the boiler head by a separate pipe, usually ½ inch in diameter, and as these pipes were from 18 to 24 inches long, they frequently became clogged with sediment, especially where the try cocks or gage cocks were seldom used. I have seen them filled, almost solid full, of the dregs of a compound used to prevent and remove scale. This sediment was soon baked hard, because these pipes were located above the tubes in order that the water level might be properly indicated, and, as a matter of course, they were in a hot place. The top and bottom connections for the water-gage glass were made in the same way, and were open to the same objection, or at least the bottom one was, as it always secured its share of the sediment.

The principal advantage of this form lies in the fact that if one of these pipes becomes clogged with sediment it does not affect the others, and they can be used until one that is rendered useless by mud can be cleaned out.

Where they are used we usually find a style of boiler in which the doors extend but a few inches above the level of the top row of tubes, and but little regret may be expressed at the passing of this kind of front, as it is a nuisance when it is necessary to clean the tubes.

Where the improved style of front, with doors that extend to a level with the top of the shell, is used, it becomes necessary to find some other place for the water gages, and on this, as well as on other accounts the combination water column is used, with only a single connection at the top and at the bottom, but the pipes are usually 1¼ inches in diameter, which makes them less liable to become choked with sediment, and, as the top one does not enter the smokebox or front connection, it is not subjected to the heat of the escaping gases, while the lower one is so low down (as it enters the head just above the bottom tubes or a little higher up) that it does not get hot enough to do any damage, and scum which floats near the surface of the water does not enter it. It should be blown out every day as some sediment will settle in it, and it is a good plan to have the drip pipe the full size of the lower connection in order to create a rapid circulation while the drip valve is open. I notice that in many cases this pipe is much reduced, sometimes as small as ½ inch, but this is wrong, for it is much better to open a 1¼-inch drip valve for five seconds than to keep a ½-inch valve open for five minutes. The first water column that I ever had charge of had no drip valve whatever, as it was not considered necessary, but it was soon afterwards fitted with one. If there is no better place for this drip to discharge into, let it go into the ashpit, but the objection to this is that if the pit is not well wet down the light ashes will come out and cover the boiler front, to the disgust of the fireman if he wishes to keep it clean.

When locating a water column, it is customary to put it high enough to bring the water level about 3 inches over the top row of tubes, when water begins to show in the glass. Care should be taken to avoid forming pockets or traps in either top or bottom connections when putting up the piping, as they may cause a false water level in the glass, and so make trouble. Careless pipers have sometimes done this work in such a slovenly manner that water would show in the glass when there was none in the boiler. If a globe valve is put into the top connection, the stem of it should be horizontal.

Do not use these connections for any other purpose whatever, as drawing steam out of one or water out of the other will disturb the water leve' in the glass, so that it will not agree with that in the boiler, and and will thus cause trouble. If the valves are not opened it will have the same effect, which has caused some engineers to condemn the use of valves in these pipes; but a man who will fail to know where the water level is before he starts the fire, is scarcely the proper person to be kept in charge of a boiler.

An improved form of water column has a settling or sediment chamber below the column proper, but this makes it necessary to connect the lower pipe into the side; and as this calls for more elbows, and, moreover, as the upper pipe enters the top, it makes an awkward-looking job to have the lower one come in on the side, as it lacks uniformity. If it is connected into the bottom there is usually about 2 feet of 1¼-inch pipe below it before the tee is reached, and then there is another short length before the drip valve is put on, so that, in a majority of cases at least, no other settling chamber is needed. This is my experience after nearly five years' trial of it, but the conditions in my case are especially favorable.

Technical Publications.

"File Filosophy" is the subject of a dainty, and at the same time very practical booklet just issued by the Nicholson File Company, of Providence, R. I. It treats briefly, yet comprehensively, of the general classification of files and definition of file terms, the proper methods of handling and using files so as to secure the best results, and gives descriptions of the most common files and the ordinary uses to which they are applied and for which they are best adapted. It thus covers all the points which most interest and concern file users, and will be found by them a most readable and valuable book. The book is really an abridgement of the Nicholson Company's "Treatise on Files," which was published in 1878, and which has always been accepted by the craft and trade in general as the authority on matters pertaining to files. It is in response to a continued demand for this "Treatise," now out of print, that the present "Filosophy" is published. The matter is carefully compiled and edited, illustrated with helpful plates, and affords a valuable addition to popular literature on technical subjects. It is a book which all interested in files will do well to procure, and it may be had upon application to the Nicholson Company's main office in Providence.

Improvement in the Manufacture of Steel Wool.

There is now an established demand for steel wool, and its manufacture is in successful operation in this country—in fact, in tnis city. The process by which it has heretofore been produced, as described by us a couple of years ago, consisted in clamping together a number of circular disks of thin sheet steel, slowly revolving them, and then with a sharp-edged flat tool taking off thin shavings from the edges of the disks until they were all converted into "wool." The improved process, lately patented, consists in winding a long sheet of thin sheet steel into a tight roll, and then using a flat cutter to shave the "wool" from the end of the roll. This latter process is evidently the cheaper, involving both less labor and less waste of material.

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American Shipbuilding.

The article which we reproduce in another column from the London "Statist"—one of the leading financial authorities of the world—is a noteworthy admission regarding the new conditions which surround the shipbuilding industry in this country. That the conclusions are sound, we believe no student of recent industrial history can doubt.

Since the beginning of the era of iron shipping American shipbuilders have been fatally handicapped by the higher cost here of shipbuilding materials, and the consequent steady decline in American merchant shipping is a familiar story. During recent years—that is since 1896—this condition of things, however, has been reversed. Beginning with pig iron there has been a steady growth in the exports of crude iron and steel in all forms, one of the recent additions to the list, and one of immediate interest in this connection, being that of ship plates, which have been supplied in large amounts to British shipbuilders. At first this movement was heralded abroad as a specimen piece of Yankee brag and bounce, the purpose of which was purely spectacular and not based on ordinary business principles. It has now come to be recognized, however, on both sides of the Atlantic, that the trade has been carried on because found to be profitable, and that the conditions which have brought it about bid fair to be permanent.

Alongside of this movement in the cruder forms of iron and steel has gone an equally important one in the higher grades of machinery, and there can be no doubt that the conditions which have more than equalized the costs of these various products will also, and in the near future, equalize the costs of shipping and lead to the rehabilitation of that industry on these shores. When our iron and steel in the cruder forms, and when our manufactured machines of all grades from matches to locomotives can be sold throughout the world, and often under the nose of foreign producers and in the face of hostile tariffs, it is as plain as a pike staff that no obstacle remains to prevent American merchant shipping taking its old place on the seas. The question of materials is absolutely settled by the repeated sales of such materials from American steel works to British ship-yards, and while we shall no doubt continue to hear some of the old parrot talk about "the pauper labor of Europe," the lie is given to it by the growth of our export trade in manufactured goods. There can be no doubt that the same and similar labor-saving tools and methods which have placed other industries in successful competition with foreign producers will accomplish similar results in shipbuilding.

Meanwhile this same increased foreign trade demands the ships. A leading note of the recent convention of the American Manufacturers' Association was the imperative need of new and direct lines of communication with the foreign countries to which our products are going in such increasing quantities. With the capacity to supply the ships and the market for their services already established, there can be no doubt of the result. The handwriting is upon the wall. The revival of American merchant shipping is in the immediate future.

The Mechanical Bearings of the Blizzard.

Whether it is weather or war that we have for the moment to think and talk about, we soon fetch up against things mechanical. We have lately had a little touch of what some are disposed to speak of as "old-fashioned" winter weather, which means that we experienced an unusual concurrence of low temperature, high wind and snow, and of more than usual duration. It is to be confessed that in this city our mechanical facilities for a time looked smaller than usual. Autotruck stock, which of late has been booming lively, must have been very quiet while the storm was raging. Many places in the city, residences and others, had small stocks of coal on hand, some enough for a day or two, others none at all. The coal wagons kept struggling bravely through all the storm, and did much necessary work towards making life endurable; but without the poor horses where would we have been? The snow melting machine, that we often hear about in mild weather, would also, probably, have made a sorry exhibition of itself if it had ventured out. Our mechanical means of transit were paralyzed for but a short time, the elevated road scarcely at all, the cable roads not much, the electric roads most of all, but the wonted activity of all was soon resumed. The ferryboats probably were the most seriously interfered with by the ice which they were unable to push out of their way, and which in the slips they actually pushed in their way. Where the water supply was dependent upon pumps, as in Brooklyn, they were crowded to the utmost to maintain a respectable showing against the thousands and thousands of little streams that were kept running as a precaution against freezing up. There was perhaps nowhere a more creditable display of mechanical facilities and operations in combat with the fierce forces of nature than in the several large fires that occurred. The apparatus of the fire department was promptly on hand upon each alarm, thanks again to the horses, was handled with skill, bravery, persistency and efficiency, and property and life were safe. Within the buildings where plenty reigned there was warmth and light and cheerfulness and no discomfort. In the places of industry there was little or no interference with the usual earning of wages. Those unfortunates who were caught out of all touch with the interwoven mechanical facilities of modern life were never more wretchedly placed. The absolutely poor were never more poor and helpless and hopeless.

A Great Fire Without Loss.

On February 15 the principal machine shop of the New York Navy Yard was totally destroyed by fire, with all the tools, a great stock of old patterns, important plans, drawings and records, and portions of the engines of two ships undergoing repairs. The loss entailed, based upon the original cost of the property destroyed, was quite large, reaching perhaps to a million dollars. The actual loss, in view of all the circumstances and relations of the case, would be a minus quantity much larger than the figure mentioned. The foundry building, including also the coppersmith shop, un-

fortunately still survives, or the negative loss would have been considerably greater. We have not a word of regret to offer over the destruction of the principal construction and repair shop of our Navy Department. We spoke of the shop, and of its back-number character, last September, suggesting that, as a shop, it was more fit to be associated with Cervera's fleet than with those of Dewey or Sampson or Schley.

The shop was antiquated, inadequate and inefficient. And in saying this we are casting no reflections upon any individual of the present or of the past. It was a growth or product of conditions and of a system which of late have undergone great transformation. A necessary concomitant of substantial improvement is not only the installation of new means and methods, but also the elimination of the old, and this latter was lost sight of, so that many old tools, old practices and old arrangements stood in the way of the new ones that might, and should, have taken their places, only that the destructive authority was not conceded or exercised. The fire has now benignly, and not too soon, done what would have taken long and could never have been done so completely by official action. As we have intimated, it is much to be regretted that the fire could not have swept a little farther.

We may assume now that a new shop will be erected not unworthy of the times or of the nation, perfectly arranged and fully equipped for the large and rapidly growing demands which it must satisfy. Nowhere would it seem more necessary and proper to spend money liberally than in the means for maintaining in highest condition and efficiency the costly machinery of modern warfare. The responsibility of the machine shop for the performance of the machinery which constitutes almost exclusively all modern naval equipment it is almost impossible to exaggerate. The wonder of it is that the shop, notwithstanding its duties and responsibility, should cost so little. The money that builds and equips a single first-class battleship would install complete a magnificent shop which would be sufficient for many years to come, notwithstanding the anticipated growth of the navy. The necessary appropriations cannot fail to be forthcoming. The maintenance of an efficient navy being the conceded national purpose, the means of its maintenance must be included. The shop behind the ship is important as well as the man behind the gun.

Practical Snow-Melting.

When we have once seen snow-melting done in the cheapest and simplest way, nobody has any more chance of selling us a snow-melting machine. There is absolutely no machine or ingenious contrivance required, and ingenuity employed in the attempted solution of the problem will be wasted. The H. W. Johns Manufacturing Company, at their building, 100 William street, in this city, after the recent great snow storm, showed the public how simply snow may be melted. A ½-inch steam pipe was run out of the basement window and laid flat on the ground, with the open end in the middle of the street. This end was buried in a pile of snow and the steam was turned on full head. The water, of course, soon began to flow, and it was led by a gutter in the snow to the nearest sewer opening. Then all there was to be done was to pile on the snow, which a couple of men with snow shovels could do with ease. The stream of water flowing away was about 6 inches wide and perhaps an inch deep, not flowing very fast. With steam in almost every building, there is also thus in every building about the best snow-melting apparatus that can be devised, and the local melting of snow may be a practicable thing. If any melting of snow is to be attempted by the public authorities, the boilers of the fire engines, with a length of steam hose, which is a part of the equipment of each, are all the apparatus required, at least for a demonstration, and there is no legitimate opportunity for any arrangement to use any patented snow-melting device, so called. The melting by steam employs all the heat of the steam, and the melting is therefore done as economically as it would seem to be possible to do it; but, after all, the fuel cost will be found to be the fatal and conquering objection against any extensive snow-melting operations.

Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(18) P. S. T., Pittsburgh, Pa., asks for formulas for calculating the centrifugal force and the rim tension due to centrifugal force in fly-wheels. A.—For centrifugal force use the formula:

$$F = .000341\ W R r^2$$

For the strain on any cross-section use the formula:

$$S = .00005427\ W R r^2,$$

in which

F = centrifugal force of entire rim
W = weight of rim in pounds
R = mean radius in feet
r = revolutions per minute
S = total strain on any cross-section

In our issue for February 17, 1898, you will find a diagram which will save a good deal of labor in making these calculations.

(19) Subscriber, Orangeburg, N. Y., asks: (1) What is gravity or the gravity of a body? A.—By gravity is meant the force with which a body is drawn to the earth. The gravity of a body is essentially the same as its weight. (2) In connecting an outhouse with a dwelling house by a burglar alarm, can I lay common wire underground in iron pipes? A.—No. You should use wire properly insulated for the service. Consult the manufacturers of such materials. (3) Is a sal-ammoniac battery suitable for this purpose? A.—Yes, if the alarm is to be, as practically all of them are, of the open-circuit type—that is, open under normal conditions and closed when the alarm is ringing. Your question about compressed air is not clear.

(20) G. H., Kansas City, Mo., asks: (1) Why are all gas or gasoline engines made with a center crank instead of a side crank? A.—We are not sure that all such engines are so made. They are generally made with a center crank for the sake of having each engine self-contained and complete in itself. If a side crank was used an outboard bearing would be necessary, and that would necessitate a careful and accurate setting and maintenance of both engine bed and outboard bearing to keep the shaft in line. The heavy fly-wheels which engines of this type carry also probably have to do with determining the arrangement of bearings. (2) What is the best way to harden a flat drill to drill spring steel which is not annealed? A.—We do not know any better way of hardening the drill than some of the old-fashioned and familiar ways, such as heating the drill as hot as it can be with safety and dipping it in saturated brine. Much depends upon the selection of steel out of which to make the drill, and it pays to get the best, with small regard to its price.

Standardized Iron Drillings.

Thos. D. West, Sharpsville, Pa., chairman of the American Foundrymen's Association Committee on Standardizing Iron Drillings, reports that up to February 1 there were 19 blast furnaces, 17 steel and iron works, 13 colleges, 11 iron foundries and 10 private laboratories using its standards, an account of which appeared in the "American Machinist," December 1, 1898, page 908; and also reports that he is in receipt of many letters praising the utility and excellence of the samples being sold to the trade, and the greater confidence they inspire in the uniformity of laboratory work.

In the machine shops at the Texas State Penitentiary a 24-inch double leather belt has just been thrown out after forty-one years of service. It was the main engine belt, and began service with the engine.

The American Society of Civil Engineers recently announced a meeting of the society to occur at their house in New York at 20.30 o'clock, thus springing the twenty-four hour clock system upon those who wished to attend, and causing some inquiries and explanatons as to the time intended. Commodore Melville, who was to be present, was one of those who had to inquire and to be informed that 8.30 P. M. was intended. The twenty-four hour system has common sense behind it, but we should know when it is adopted.

Personal.

Mr. L. V. Ludy has been made assistant in the engineering laboratory of Purdue University, La Fayette, Ind.

Franklin Institute has awarded the Elliott Cresson Gold Medal to Mr. Clemens Herschel, for the invention of the Venturi meter tube.

Mr. W. Gulowsen, who is engineer for Mr. A. Gulowsen, of Christiania, Norway, dealer in machine tools and other machinery there, has recently arrived in this country with the intention of spending about four months investigating machinery matters.

Obituary.

Robert F. Darling died in Cleveland, Ohio, January 10, aged thirty-one years. He was employed as draftsman by the Chisholm & Moor Manufacturing Company. Mr. Darling was a thorough mechanic, and he had held several responsible positions. He was an expert at designing and the manufacture of bicycles, and was with E. C. Stevens & Co. for several years.

John Adams Emerick, a well-known steel manufacturer, died at Langhorne, Pa., February 15; seventy-one years old. He was born in Hudson, N. Y., and went to Philadelphia when 19 years old and became a molder. About 1858 he established the then new business of manufacturing foundry facings and supplies, which business he continued until about six years ago, when he retired. He was at one time president of the Eureka Cast Steel Company.

Lewis Miller, the millionaire plow manufacturer of Ohio, but best known to all the world as the father of the Chautauqua Assembly, and its president ever since it was founded, died in this city, February 17, as the result of a desperate surgical operation. Mr. Miller was born in Greentown, Ohio, in 1829, and early learned the machinist trade. While still a young man he started a shop in Canton Ohio, and engaged in the manufacture of agricultural machinery, which his inventive faculties did much to develop and improve. He steadily prospered in business and established other works in Akron and in Mansfield, the former of these becoming his permanent home. At the time of his death he was president of the Canton firm known as C. Aultman & Co., and of the Akron firm of Aultman, Miller & Co., and was also the largest stockholder of the Mansfield concern known as the Buckeye Mower and Reaper Works. Mr. Miller had been a member of the American Society of Mechanical Engineers since 1883. Although he sustained heavy losses in 1893 he was still rated as a millionaire. He did much philanthropic work besides the practical educational operations at Chautauqua. He is survived by his wife, eight sons and three daughters, the eldest of whom is Mrs. Thomas A. Edison.

Commercial Review.

NEW YORK, FRIDAY EVENING,
February 17, 1899.

CHICAGO MACHINERY.

There have been within the past week or two very fair delegations of country buyers of machinery on the street. They have been "looking around," and in a majority of instances went away wthout purchasing. But they left behind them a rich crop of promises; nearly every one on the street says there is a large amount of business in sight. Some dealers in machine tools report an unusually active trade. Those who do not are pleased with the promises.

Since a month ago machine tools have advanced in this market from 5 to 20 per cent. As the upward movement seems to be general, it is not affecting anyone especially to his disadvantage. Store stocks of machinery are dwindling away. All the larger tools have disappeared. Several large machines which have stood in stock here for several years have gone to Pittsburgh and other localities, not directly tributary to this market. The buyers wanted machines and, not being able to obtain quick shipment from shop, and learning of the samples here, made immediate purchase. Some large machines, which were ordered four months ago, are being shipped to the buyers. Present purchasers for the same class of tools are promised deliveries in from six to eight months. In other words, the builders, though working in many instances night and day, are steadily falling behind in their orders. One seller here remarks that for the larger sizes of tools a producing capacity 50 per cent. greater than the present could be profitably employed.

A classification of the buying is elusive. No two orders are alike. Planers have had a big run within a week or two, but the activity extends to all kinds of tools. One of the large buyers on the street last week was the McCormick Harvester Company. A representative shopped around thoroughly on the street and picked up quite a number of tools at various places. A year ago the tool men would have done the walking to the office of the buyer. The incident illustrates the present character of trade. A desirable tool of large size is a prize to be searched for and the hustler gets it. Other buyers wait until the machines can be built.

METAL-WORKING MACHINERY.

If any formal proof of the great activity now existing among tool builders were needed it could be found in the slowness of deliveries. A difficulty in getting tools from the factory to fill orders is a common complaint among sellers. One New York house, for instance, ordered for a customer a planer which was to be delivered on a certain day this month, and as the time approaches the builders write demanding an extension of five weeks. Another seller, who likes to talk very pessimistically, bewails the unfortunate condition of the times. One symptom he finds is that there is no great demand for tools, and another is that the factories are so crowded that you can't get the tools when you do get an order, and so your customer gives you the slip! An instance of the activity in large tools is found in the case of an Eastern firm, who are said to be sold out eight or ten months ahead. A company having large warerooms for small tools in New York remarks that its store stock is dwindling.

Since the first of this year trade in metal-working machinery has been excellent in practically every case we have heard of. One of the largest and oldest Eastern companies, whose business, though generally heavy, is of a somewhat conservative nature, notices in its New York office a radical increase since the middle of January. Inquiries are reported voluminous. The condition of foreign trade continues to be spoken of in favorable terms, but it is no longer cultivated as a means of staving off bankruptcy. Exports were once a necessity, now they are a luxury.

The elements of Nature have lately brought their influences to bear upon machinery. The cold and snow have caused a falling off in calls at offices; but aside from some delay through blockage of transportation, they have had no particular effect upon mail orders. The devouring element, fire, has been at work for the benefit of tool builders, if to the detriment of tool users. The equipment of the Manhattan Brass Company, 334-336 East Twenty-eighth street, New York, was largely destroyed the other day, and the company is in the market for new tools. The conflagration of machine shop No. 2 at the Brooklyn Navy Yard destroyed machinery said to be worth $400,000, including a pneumatic machine plant recently placed in the building at a cost of several thousand dollars. The greater part of the equipment of the shop was not regarded in machine-tool commercial circles with profound respect. It is alleged to have comprised a great deal of antiquated rubbish which it is a God-send to the nation to be rid of. In view of the present attitude of our Government toward naval construction, it does not look as if tool builders would have to wait long before having a chance to bid on a new outfit.

The E. W. Bliss Company has received a very satisfactory and growing trade since the first of the year. Prosperity throughout the country is occasioning many increases of manufacturing facilities

among sheet metal workers. Foreign trade also continues to prosper. The orders are coming notably from England, France, Switzerland and Belgium. The Bliss company has completed its contracts for Whitehead torpedoes, and is awaiting others which are in sight.

The Mossberg & Granville Manufacturing Company also reports an excellent demand for presses. Inquiries are numerous, quite a number of them coming from the jewelry trade.

WOOD-WORKING MACHINERY.

It must be indeed a state of national prosperity that we have entered when the demand for wood-working machinery is as active as it is at present, for activity has long been unknown to it. The H. B. Smith Machine Company finds its sales, taking the country throughout, nearly three times as heavy as during the early weeks of 1898. Their Eastern market was brisk last month, but February's sales are largely in the Chicago district. Trade is found good in Seattle and the Pacific Coast generally. Business of the American Woodworking Machinery Company, the "trust," is reported to show almost a two-fold increase over this part of 1898.

The H. B. Smith Company at its meeting this month elected Capt. Eldon A. Smith president, and Mr. W. D. Martin superintendent of the sales department. At its works, Smithville, N. J., are being installed an L. W. Pond metal planer, 72 inches wide by 12 feet long, and other tools. Among recent contracts it has taken one to install the greater part of the equipment of a compound door building plant at St. Joseph, Mich. Other concerns which will contribute to this plant are the Berlin, S. A. Woods, and Cordesman companies, and Chas. E. Francis & Bro.

CINCINNATI REPORT.

Conditions of trade among manufacturers of machinery, machine tools, engines and other articles continue very encouraging. Everyone here is busy, having all the orders he can take care of, and, in fact, enough to keep him fully occupied for some time to come. There is a gratifying expansion of home trade. The increase thus far is more in proportion than it was in the first six weeks of last year. With this, there has been quite a good amount done in export trade, showing some increase over the early part of 1898. Some manufacturers who have been putting up with many inconveniences have purchased ground and have had plans drawn and made contracts for erecting new buildings to meet the increased demand. These buildings when finished will have good light and ventilation, and their outfit of power and tools will be of the very best. Some of the manufacturers here who had erected good sized buildings and filled them with a large quantity of up-to-date tools, have during the past year found their business improving so much that they are now laboring under difficulties for want of advantageous room. They have decided to put up additional buildings this year. The new concerns which have started up in the last few months are getting themselves by degrees into good shape for work. They have all received orders which will enable them to keep a good number of men employed on full time. A feature of much import-

(*Continued on page 36.*)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting, Grant; see p. 16

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark,N.J.

Book "Dies and Diemaking," price $1, post paid. J.L.Lucas,Prov.,R.I. Send for index sheet.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Watch and clock tools, small automatic machines built to order; punches and dies. Waltham Machine Works, Waltham, Mass.

For Sale—One 30-inch Shellenbach pulley lathe, made by Henley Machine Tool Works; in very best condition. Curtis & Co. Mfg. Co., St. Louis, Mo.

Threads and gears; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. by G. W. Dixon, Spring Lake, Mich.

For Sale—A fully equipped and established machine shop, including real estate, in Binghamton, N. Y.; excellent opening for the right man. Particulars on application to H. J. Gaylord, Binghamton, N. Y.

Institutions retiring from business having machine tools, brass or wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

For Sale or Rent—Foundry and machine shop with additional land, in good condition and well equipped for medium heavy work; capacity of foundry 7 tons per day; located on railroad within eight miles of New York; terms easy. Call or address J. F. Sweasy, 26 Nassau street, New York.

Wants.

Situations and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Experienced draftsman and designer, technical graduate. Box 107, AMERICAN MACHINIST.

Draftsman; expert engine, general machine works; New York or vicinity. Box 115, AMERICAN MACHINIST.

Situation by a first-class tool dresser and steel worker, and a good forger. Box 93, AMERICAN MACHINIST.

Foundry foreman wishes position; experienced, heavy or medium castings. Box 73, AMERICAN MACHINIST.

Mechanical draftsman, with technical and drawing-room experience, desires a change. Box 110, AMERICAN MACHINIST.

Wanted—Position as draftsman, by a technical graduate; shop experience; best of references; will go anywhere. Despatch, AMERICAN MACHINIST.

Foundry foreman twelve years in one shop, had charge over 100 men, age 48, wants position, house or machinery; a hustler. Box 114, AMERICAN MACHINIST.

Wanted—Position as foreman; had experience on general machinery, dynamos, tools; can design tools for interchangeable work. Address P. O. Box 304, Derby, Conn.

Experienced M. E. and draftsman, thoroughly acquainted with design and construction of engines, high speed and otherwise, desires responsible position; thorough prac. and theoretical knowledge. Box 106, AM. MACH.

Position Wanted—Electrical machinist, with 8 years' experience superintendent commutator dept.; capable of designing, constructing special tools; also 9 years exp. mfg. typewriters; A1 refs. Box 108, A. MACH.

Young man, bright, aggressive, speaks French and some Spanish, is machinist and draftsman, 5 years' exp. selling mech. specialties, well connected in Paris and London, wants position, U. S. or Europe. E. E. Heilbron, 153 La Salle st., Chicago.

Brass-room foreman wishes to correspond with parties in need of a first-class man, up to date in manufacture of brass valves, plumbers' supplies, etc.; has a thorough knowledge of tool designing and monitor lathes. Box 92, AMERICAN MACHINIST.

Mechanical engineer, 15 years' experience on various designs, modern marine and stationary engines, general and special machinery, years in charge of engineering department, desires to change; Eastern States preferred. Box 95, AMERICAN MACHINIST.

Position by young man, age 30, with 10 years' experience as machinist, erecting engineer and foreman, and 5 years government engineer of sea-going steamers; 4 years as chief engineer; energetic, ambitious and sober; fair draftsman and good manager of men; references from naval officers and shop managers. Box 109, AMERICAN MACHINIST.

Help Wanted.

Wanted—Partner with some capital; man able to design gas engines preferred. Address Box 116, AMERICAN MACHINIST.

Wanted—A machine blacksmith; one accustomed to heavy work. Apply, with references, Box 112, AMERICAN MACHINIST.

Mechanical draftsman for factory in Buffalo, N. Y.; reliable and quick worker; state experience, age and salary. Box 111, AMERICAN MACHINIST.

Draftsman wanted; mechanical; sober, industrious and rapid; not over 35 years old. Apply 32 Nassau street, Room 704, New York, before 10 A. M.

Business Opportunity—A practical young man wanted to invest in one-half interest in an old-established manufacturing house; object, aid in managing and sales; good salary; best of references. Address, with references, "Business Opportunity," AMER. MACHINIST.

Wanted—Assistant foreman for machine shop; active young man who is familiar with modern machine-shop methods, and who has had experience in engine building and repairing. Apply by mail, stating age, nationality and past experience, The Atlantic Works, East Boston, Mass.

Wanted—For large machine works in Holland, A1 draftsman, familiar with constructing hydraulic and electric elevators and hoisting machinery; good position for the right person, with prospects of taking charge of drawing office; state experience and salary wanted. Box 113, AMERICAN MACHINIST.

Wanted—An up-to-date, experienced foreman for shop manufacturing engine lathes; must thoroughly understand rapid production on this class of work; state experience and wages wanted; steady employment for right man in small New England town; correspondence confidential. Box 100, AMER. MACH.

Foreman for machine shop, present capacity for forty men; must be thoroughly up in best New England practice for rapid and cheap manufacture of high-grade tools, weighing from 2 to 6 tons each; and must be capable of handling men. Address, stating previous experience and salary expected, "New Jersey," AMERICAN MACHINIST.

PATENTS secured in the United States and foreign countries. Investigations as to novelty and validity. Litigation conducted in the Courts and Patent Office. Members of the bar of the United States Supreme Court and various Circuit Courts.

BALDWIN, DAVIDSON & WRIGHT,
25 Grant Pl., Washington, D. C. 141 Broadway, New York.

(*Continued from page 35.*)

ance to all manufacturers in machine tool and kindred lines here is the advance in price which has been made on raw and finished material. The most important advance has been made in pig iron, showing a great change since last July, amounting to $3.25 or $3.50 on No. 2 Southern coke iron. An increased charge for castings is talked of by foundrymen. This will tend to elevate prices of machinery. There may be some cases where parties here have castings due them on contracts made before the great increase in the price of iron, and will secure the benefit of it in any advance made in prices of machinery or machine tools. There has also been quite an uplift in the price of finished steel used in manufacturing, and the prospects are for another raise. All this will tend to increase the advance in prices of the manufactured articles. Steel mills and forges are very busy indeed, with such a large number of orders on hand that in some lines there is difficulty in getting orders promptly filled, and some buyers much in need of material are paying a bonus for quick shipment. This remark applies also to shipment of raw material. There is another factor in these lines of business which is attracting attention and causing much comment, and that is the formation of combinations. Much solicitude is manifested for the outcome of it.

We print herewith some of the reports we have received during personal interviews with representatives of machinery-manufacturing companies, which will tend to confirm our assertion that exceptional activity now characterizes the Cincinnati market:

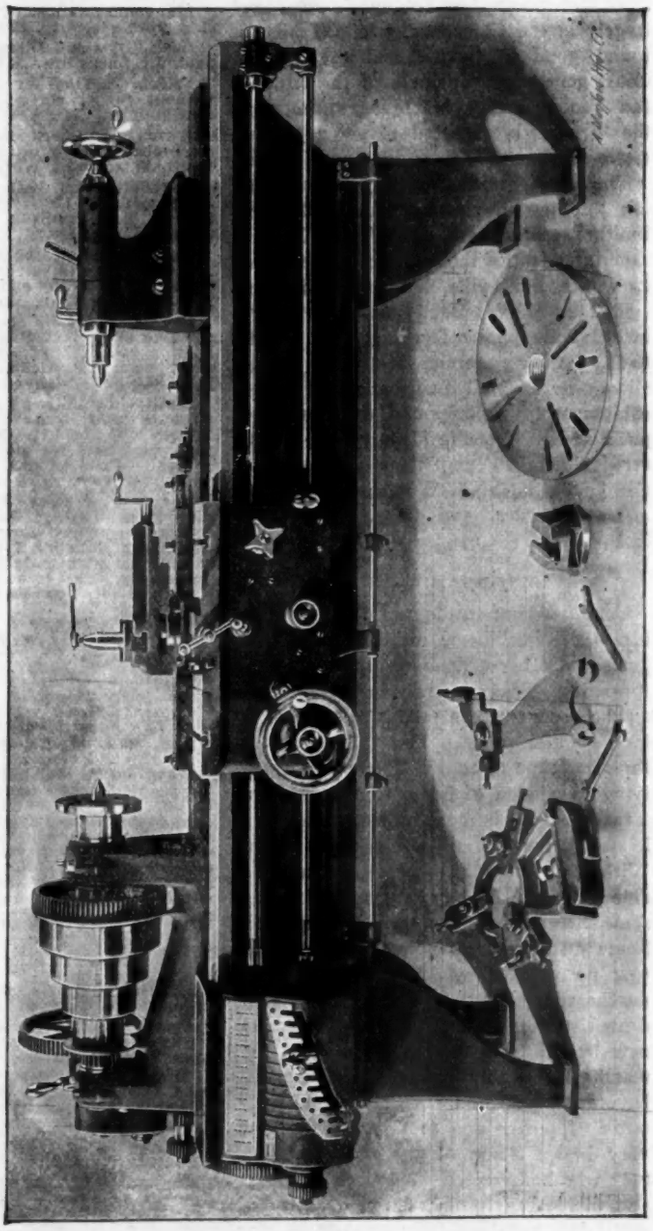
The Sebastian Lathe Company is working a good many men on full time to the utmost limit of its present facilities. It estimates its business for last year some 50 per cent. ahead of 1897. About three-fourths of the output is being sent abroad. Its domestic trade shows improvement. Inquiries are quite well distributed. Some shipments have been made to South Africa, good orders are coming from Sweden, there is some increase from Scandinavia, and quite a number of shipments have been made to Holland.

Dietz, Schumacher & Boye are finding quite a large increase in their trade this year. A fair proportion of it is in domestic, with an improvement over 1898. They are cramped for room and are planning to build an addition upon their lot in the rear of the present building, which will give them from 3,000 to 6,000 square feet, and will improve their facilities very much indeed. This addition will be fitted up with the very best class of machine tools.

Dreses, Mueller & Co. tell of a large growth in their business above what was done in the early part of last year. This, with orders unfilled at the opening of this

(*Continued on page 37.*)

20 in. x 8 ft. Hendey-Norton Lathe.



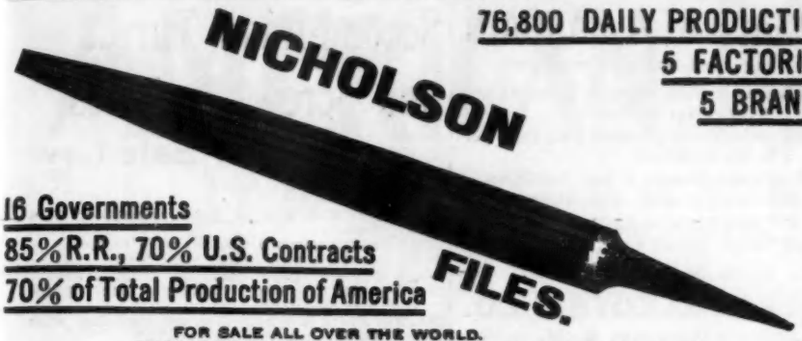
ALL these Lathes have the Norton Screw Cutting feature. All the different threads and feeds in daily use obtained by moving the handle in gear box from one notch to the other. All sizes but the 32 in. fitted with our Automatic Stop Rod for carriage. By its use you can cut threads to and from shoulders and always have the carriage stop in the same place. All lathes have the reverse motion in head, operated by lever at side of apron. By this you reverse the carriage only, which is all that is necessary in cutting threads.

These attachments mean a great saving of time and labor.

THE HENDEY MACHINE CO.,
TORRINGTON, CONN.

AGENTS FOR THE PACIFIC COAST:
PACIFIC TOOL AND SUPPLY CO., - - - - San Francisco, Cal.
J. W. CREGAR, - - - - Philadelphia Bourse Exhibition.

EUROPEAN AGENTS:
SCHUCHARDT & SCHUTTE, Berlin, Vienna, Brussels.
CHAS. CHURCHILL & CO., Ltd., London and Birmingham, England.
ADOLPHE JANSSENS, - - - - - - Paris, France.



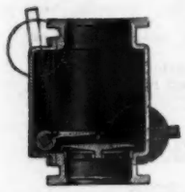
76,800 DAILY PRODUCTION
5 FACTORIES
5 BRANDS

16 Governments
85% R.R., 70% U.S. Contracts
70% of Total Production of America

FOR SALE ALL OVER THE WORLD.
NICHOLSON FILE CO., Providence, R. I., U. S. A.

Our Annealed Die and Tool Steel
Saves Time, Labor, Money.

Crescent Steel Company,
Pittsburgh, Pa.
Chicago, Ill.
New York, N. Y.
Denver, Col.



Excelsior Straight-Way Back Pressure Valve.

This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

Jenkins Brothers, New York, Boston, Philadelphia, Chicago.

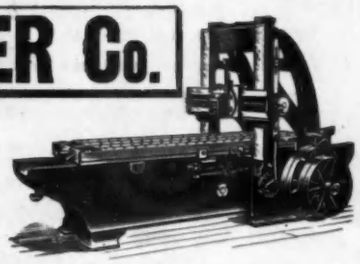
THE SPEED-LATHE. For the use of Technical Schools, Manual-Training Schools, and Amateurs. By ALFRED G. COMPTON and JAMES H. DE GROODT, First Edition. First Thousand. *12mo. vi+134 pages, 100 figures. Cloth.* $1.50. Order through your bookseller, or copies will be forwarded postpaid by the publishers on the receipt of the retail price.

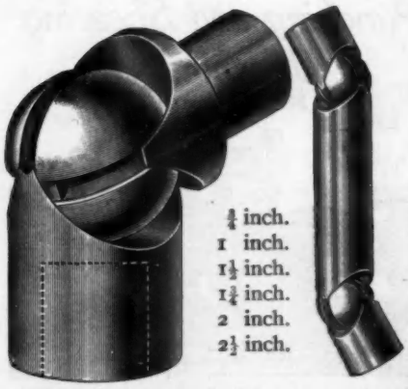
JOHN WILEY & SONS, 53 E. Tenth Street, NEW YORK CITY.

POWELL PLANER Co.

WORCESTER, MASS.

AGENTS:
U. Baird Machinery Co., 125 Water St., Pittsburgh, Pa.
J. A. Fay & Egan Co., 26 South Canal St., Chicago, Ill.
Robinson & Cary Co., St. Paul, Minn.
W. R. Colcord Mchy Co., 502 North 2d St., St. Louis, Mo.
Parke & Lacy Co., Fremont St., San Francisco, Cal.
The Fairbanks Co., 705 Arch St., Philadelphia, Pa.





¾ inch.
1 inch.
1½ inch.
1¾ inch.
2 inch.
2½ inch.

These Universal Joints are made of steel, with hardened ball, for transmission of power at angles. Made with special lengths of stem to order. Invaluable for special machinery and tools.

Address:
Vanderbeek Tool Works, Hartford, Conn.

Only one cutter is required for each pitch,

and that "cutter is correct." Instead of having a cupboard full you can keep them all on one nail, and pay for them with corresponding ease.

If you cut gears, don't fail to ask

The Fellows Gear Shaper Co.
of Springfield, Vt., about it.

Bevel Gears
Cut Theoretically Correct.
Special facilities for cutting worm and spiral wheels.
Hugo Bilgram, Machinist,
440 N. 12th St., Philadelphia, Pa.

(Continued from page 36.)

year, is keeping them very busy. Their export trade is keeping up well, and with it they are finding a nice growth in home trade. Like their next-door neighbor, they feel they will have to erect an addition in the rear of their present building, enlarging their facilities very much.

Smith & Mills, who manufacture shapers, are finding present facilities considerably taxed. They will seek to get along by adding some new machine tools and putting on more men.

The Bickford Drill & Tool Company finds that the increase of its business for 1898 over 1897 is more than was thought, and will range from 50 to 75 per cent. Some two-thirds of this was in export trade and the rest in home trade. At this time they have many orders on hand and are very busy.

The Bradford Mill Company reports a continued good volume of business, keeping a large number of men at work on full time. They are having a continued good export demand and an increase in their home trade, and find the outlook very encouraging.

The Cincinnati Shaper Company has been gradually getting its outfit in place, and has put more men to work upon the specialty it is making. It has had orders, both foreign and domestic, coming in during the several weeks occupied in fitting up its shop, and it will soon have everything in first-class shape and a large number of men at work.

The Cincinnati Machine Tool Company, recently organized, is now at work, having a good number of orders on the books which keep it quite busy for the time being.

The Cincinnati Planer Company has some men now at work on orders which have been coming in while it was fitting up its plant. As fast as it can get the machine tools in place, it will set more men at work. Members of this company were for several years with the American Tool Works Company, and of that make is the greater part of its equipment. Among other tools in place are a 60-inch planer from the East and a 36-inch Eberhardt gear cutter.

The business of the Cincinnati branch of the General Electric Company for 1898 showed an increase of 33⅓ per cent. over that of 1897. During the year it took several large contracts from street railroad lines and for electric lighting and for power machinery for manufacturing plants. The Buckeye Engine Company reports business for last year fully 50 per cent. ahead of 1897. A good share of it came from this territory. The company is very busy working a large number of men, and has a great many orders now booked,

Quint's Turret Drills, For Drilling and Tapping, are made with from Four to Twelve Spindles. A. D. QUINT, 3 Clinton St., Hartford, Conn.

showing a decided gain over last year at this time. The Snow Steam Pump Works have a good number of contracts for water-works plants. Its orders are about all it can attend to at present, and it is working an extra number of men overtime.

The J. A. Fay & Egan Company finds its business for January, this year, about double that of January, 1898; prospects bright and trade rapidly increasing. It has furnished machinery for a number of new plants during the past month, principally in the Central States. Among them were a large planing mill and several furniture and other factories.

In short, the conditions of Cincinnati's machinery trade—manufacturers working to utmost limit of capacity and rising prices—augur a year of phenomenal prosperity for 1899.

MISCELLANEOUS NOTES.

The Hyatt Roller Bearing Company is busy, and behind on orders. Some of the orders coming in are for bearings for pulverizing mills, and the company is supplying the bearings to go on the motor vehicles of a certain make. For the Alpha Portland Cement Company, Alpha, N. J., have just been finished a number of bearings of 5, 6 and 7 inches diameter. Hyatt bearings have been constructed as large as 11 inches.

Ford, Bacon & Davis, engineers, Singer Building, Liberty street and Broadway, New York, have purchased a 1,275 horsepower Allis-Corliss cross-compound condensing engine, a condenser of the same make and an 850-kilowatt General Electric generator, to be installed in the powerhouse of a railway at New Orleans, La.

Another machinery order from the South is for a block of machine tools which a New York company is shipping to Culpeper, Va.

Quotations.

NEW YORK, Saturday, Feb. 18.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$12 75	@	13 00
No. 2 foundry, Northern	12 25	@	12 50
No. 2 plain, Northern	11 75	@	12 00
Gray forge, Northern	11 25	@	11 75
No. 1 foundry, Southern	13 00	@	13 50
No. 2 foundry, Southern	12 50	@	13 00
No. 3 foundry, Southern	12 00	@	12 50
No. 1 soft, Southern	13 00	@	13 50
No. 2 soft, Southern	12 50	@	12 75
Foundry forge, Southern	12 00	@	12 25

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.18 @ 1.20c.; refined, 1.23 @ 1.30c. Store prices: Common, 1.35 @ 1.40c.; refined, 1.40 @ 1.50c.

Tool Steel—Base Sizes—Standard quality, 6 @ 7c., with lower prices on some brands: extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.60 @ 1.70c.

Cold Rolled Steel Shafting—Base, sizes, from store in small lots, 2.25c. upward.

Copper—Carload lots, Lake Superior ingot, 18½c.; electrolytic, 17¾c.; casting copper, 17½c.

Pig Lead—Carload lots, 4.42½ @ 4.47½c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, about 24c., f. o. b. New York.

Spelter—In carload lots, 6½c., New York delivery.

Antimony—In cask lots and over, 9¾c. @ 11c., according to brand and quantity.

Lard Oil—Prime city, present make, the leading brand, 47 @ 48c., in wholesale lots; some brands 2 or 3 cents less.

FOR SALE AT A BARGAIN

The following second-hand foundry equipment:

1 Colliau Cupola, melting capacity four tons per hour; in first-class condition.
1 Colliau Cupola, melting capacity six tons per hour; in fair condition.
1 No. 8 Sturtevant Blower in good condition.
1 No. 10 Sturtevant Blower in good condition.
5 36″ x 53″ double geared cast iron Rumblers.
1 26″ x 43″ single geared cast iron Rumbler.

All can be seen at our works.

GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.

POND MACHINE TOOL CO.'S
Planer 48 inches x 8 feet
A-1 Order, Immediate Delivery
J. J. McCABE, 14 DEY STREET .... NEW YORK

Machine Wanted. A German Rubber Manufacturer wishes to purchase a machine for cutting rubber washers for beer bottles.
Address sub Chiffre
D. B. 234 an RUDOLF MOSSE,
BERLIN, S. W., GERMANY.

The CROSS OIL FILTER
actually reduces oil bills 50% or more. Sent on approval. Capacities 3 to 120 gals. per day. Used in 21 countries. Testimonials from the leading firms in every field of industry.

THE BURT MFG. CO.
AKRON, OHIO, U. S. A.
Business Established 9 Years.
Largest Manufacturers of Oil Filters in the World.

CLEVELAND GEAR WORKS,
W. R. SAWYER, Lessee.
86 SENECA STREET, CLEVELAND.

GEARS of all descriptions

DON'T WORK

all your life in the same old rut. Get out of it. We will help you to a better position and higher pay if you will devote some of your spare time at home to study at a cost so low that you will not feel the outlay. Courses by mail in MECHANICAL, STEAM AND ELECTRICAL ENGINEERING, MECHANICAL DRAWING AND MACHINE DESIGN. BEST TEXT BOOKS AND DRAWING PLATES FREE. Seven years of experience in teaching by correspondence has made our courses the best, most thorough and practical. Write for free illustrated circular T, sample pages of text books, drawing plate, and booklet of letters from students all over the world.

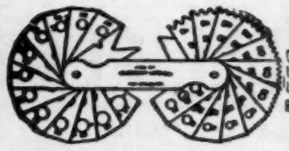
The United Correspondence Schools,
154, 156, 158 Fifth Ave., New York.

Second-Hand Turret and Screw Machines
....For Sale Low

No. 1 Brown & Sharpe screw machine, wire feed.
No. 2 Garvin screw machine, wire feed.
No. 2 Garvin turret lathe, wire feed.
No. 2 Windsor screw machine, chasing bar.
No. 2½ Garvin screw machine, back gears and oil pump.
No. 2½ Pratt & Whitney screw machine, wire feed.
No. 2½ Garvin turret lathe, wire feed and friction back gears.
No. 2½ Garvin turret lathe, automatic chuck.
No. 2½ Pratt & Whitney hub machine.
2 No. 3 Garvin screw machines, geared friction head and back gears.
No. 3 Garvin screw machine, wire feed and friction head.
No. 3 Pratt & Whitney screw machine, friction head.
No. 5 Brown & Sharpe screw machine, chasing bar.
No. 12 Garvin screw machine, wire feed.
3 No. 12½ Garvin screw machines, wire feed.
13 in. x 5 ft. Prentiss turret lathe.
15 in. Jones & Lamson chucking lathe.
16 in. x 6 ft. Fox turret lathe, chasing bar, complete.
16 in x 6 ft. Fox turret lathe, chasing bar and two jaw chuck.
18 in. x 5 ft. Stiles turret lathe.
Descriptions and photos on application.

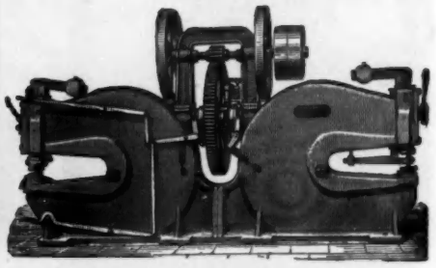
The Garvin Machine Co.
Spring and Varick Streets
..... NEW YORK

Philadelphia Store:
The Garvin Machine Co.
51 No. 7th Street, Philadelphia, Pa.

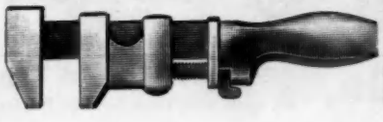


Blodgett
Comb, twist drill, thread pitch, centre and top drill gauge.
PRICE, $1.50 EACH.
Gauge and 510 page Catalog sent postpaid for $1.40, or Catalog alone for 25 cents.
MONTGOMERY & CO., TOOL MAKERS,
105 FULTON STREET, NEW YORK CITY.

Power Punching and Shearing Machinery
For all purposes.



Manufactured by
The Long & Allstatter Co.,
Hamilton, Ohio.



RAPID TRANSIT WRENCH. Operated by thumb. Stays at size set. Open 1 5/16 in. Length 8 in. Better have a dozen. $3.60. Cash.
FRASSE COMPANY, 17 WARREN ST., NEW YORK.